



# ESP Serial Hub

Installer/User Guide



**INSTRUCTIONS**

This symbol is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

**DANGEROUS VOLTAGE**

This symbol is intended to alert the user to the presence of uninsulated dangerous voltage within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.

**PROTECTIVE GROUNDING TERMINAL**

This symbol indicates a terminal which must be connected to earth ground prior to making any other connections to the equipment.



# **ESP Serial Hub**

## **Installer/User Guide**

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## **USA Notification**

**WARNING:** Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

**NOTE:** This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in the residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

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Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe A prescrites dans le Règlement sur le brouillage radioélectrique édicté par le Ministère des Communications du Canada.

## **European Union**

**WARNING:** This is a Class A product. In domestic environment, this product may cause radio interference in which case the user may be required to take adequate measures.

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**CHAPTER****1*****Introduction*****Features**

ESP Ethernet serial hubs contain an autosensing 10/100 Ethernet port and multi-interface (MI) serial ports. MI ports may be configured to use the RS-232, RS-422 or RS-485 physical interface.

- The ESP-2 MI hub contains two MI serial ports.
- The ESP-4 MI hub contains four MI serial ports.
- The ESP-8 MI hub contains eight MI serial ports.
- The ESP-16 MI hub contains eight MI serial ports and eight dedicated RS-232 ports.

Modular adaptors are available to facilitate the connection between the ESP serial hub ports and target devices.

**Serial port access**

All ESP hubs support several ways to access the serial ports. Each of these connection methods is described in Chapter 3, beginning on page 15.

- Serial port redirection
- Telnet server
- Raw TCP server
- Raw TCP client
- Modem emulation
- Configuration utility

Serial port redirection uses drivers installed on a host computer. The ESP serial hub drivers are supported on the following operating systems:

Windows® 2000

Windows NT® 4.0

OpenServer™ 5.0.5a or higher

Linux®

Sun® Solaris™ for X86 or SPARC 8 or higher

Windows XP

Windows Server 2003

UnixWare® 7.0.1a or higher

AIX® 4.3 and 5.1/5.2

For serial port redirection, the ESP hub is configured using the appropriate drivers running on any Microsoft Windows host, or `espdiag` and `espcfg` for OpenServer, UnixWare, Linux, Sun or AIX systems. Certain configuration values are set during driver installation.

The file-driven ESP-Install program may be used to install, modify and remove Windows drivers for ESP serial hubs without the need for on-site technical personnel. See *ESP-Install Program* on page 61.

All other connection methods do not require the use of drivers.

## Management tools

You may configure and manage an ESP serial hub using the following tools:

- Web interface - see Chapter 4, beginning on page 31
- Configuration utility - see Chapter 5, beginning on page 43
- Configuration files - see Chapter 6, beginning on page 55
- Unix system utilities `espcfg` and `espdiag` (Unix systems) - these utilities have limited support for connection methods other than port redirection
- Socket Application Program Interface (API)

The web interface and the configuration utility offer the most comprehensive sets of available operations, including:

- Displaying and changing network configuration values
- Displaying and changing a port's physical interface (ESP-4 MI, ESP-8 MI and ESP-16 MI hubs)
- Displaying and changing a port's attributes
- Displaying, enabling/disabling and configuring connection methods for each port
- Sending a line break to a port
- Displaying hardware information
- Displaying or updating Flash memory
- Displaying or enabling/disabling configurable features
- Downloading a configuration file
- Rebooting or reinitializing the hub
- Displaying general and port statistics
- Displaying connection status
- Diagnostics
  - Using the web interface, you may launch the ESP-View diagnostic utility that provides datascopes, loopback and status functions; see Chapter 8, beginning on page 67
  - The configuration utility also supports diagnostic features; see *Displaying and Using Debug Features* on page 52

The ESP hubs support attended and unattended configuration. With attended configuration, you set values and request actions directly through the web interface or the configuration utility. Unattended configuration uses a flat text file containing configuration commands. The commands are processed as if they were requested using the web interface or the configuration utility. The command file may be read by BootP/DHCP during initial ESP hub configuration. Downloading a command file may also be initiated using the web interface and configuration utility. See Chapter 6, beginning on page 55.

The ESP serial hub also provides a socket API for on-the-fly serial port operations. This API is an extension of the raw TCP interface, which allows data to be read from or written to an ESP hub serial port. Using socket calls, an application is able to alter port settings (such as baud rate) or read current serial control signals (such as DTR). For details on the API specification, contact Avocent Technical Support.

## **Version**

This document covers features available with the ESP hub application version 3.05 or later.

ESP-2 MI serial hubs and Avocent ESP MI serial hubs will accept the new firmware; check the CD that ships with the hub (and the [www.avocent.com](http://www.avocent.com) web site) to verify the current boot and application versions.

Older hubs are not compatible with the new firmware. For information about older hubs, you can reference the manual that shipped with the hub, download the original manual from the web site or contact Technical Support.



## CHAPTER

## 2

## Hardware Installation and Network Configuration

### ESP Serial Hub Kit Contents

- ESP serial hub.
- SuperSerial CD-ROM.
- For ESP-2 MI and ESP-4 MI hubs: External power supply (PS) with attached PS-to-unit barrel connector. The line cord for the power supply is appropriate to the intended country of operation.
- For ESP-8 MI and ESP-16 MI hubs: AC power cord.

Modular adaptors are available from Avocent; see *Adaptors* on page 77.

### LEDs and Buttons

All LEDs and buttons are on the front of the ESP serial hub.

**Table 2.1: LEDs and Buttons**

Item	Models	Description
POWER	All	The <i>POWER</i> LED is lit when the hub is connected to a power source.
ONLINE	All	The <i>ONLINE</i> LED is lit (not blinking) when the hub's self-test and initialization procedures have completed successfully. On ESP-4 MI hubs at power up, the LED will blink rapidly until the hub is initialized, then it will be lit (not blinking). If a problem occurs, the LED will turn off.
10	ESP-2 MI and ESP-4 MI	The <i>10</i> LED is lit when the hub is connected to a 10 Mbps LAN, and the <i>100</i> LED blinks when traffic is present on the 10 Mbps LAN.
100	All	The <i>100</i> LED is lit when the hub is connected to a 100 Mbps LAN. On ESP-2 MI and ESP-4 MI hubs, the <i>10</i> LED blinks when traffic is present on the 100 Mbps LAN.
LINK	ESP-8 MI and ESP-16 MI	The <i>LINK</i> LED is lit when the hub establishes a connection to the network.

**Table 2.1: LEDs and Buttons (Continued)**

Item	Models	Description
TRAFFIC	ESP-8 MI and ESP-16 MI	The <i>TRAFFIC</i> LED blinks when there is traffic on the LAN.
RESET	All	Pushing (and holding for ESP-8 MI and ESP-16 MI hubs) the RESET button reboots the hub; see <i>Resetting</i> on page 13.
INIT	All	Pushing and holding the INIT button restores the hub to factory defaults; see <i>Reinitializing</i> on page 13.

## Physical Interfaces

Table 2.2 summarizes the ESP serial hub physical interfaces and connector information. Details follow the table.

**Table 2.2: Physical Interface and Connector Summary**

Model	Connector type and location	Physical interfaces can be configured on			Where physical interface is configured
		RS-232	RS-422	RS-485	
ESP-2 MI	DB-9 Front of hub	all ports (1-2)	all ports (1-2)	all ports (1-2)	hardware
ESP-4 MI	DB-9 Front of hub	all ports (1-4)	all ports (1-4)	all ports (1-4)	software
ESP-8 MI	RJ-45 Back of hub	all ports (1-8)	all ports (1-8)	all ports (1-8)	software
ESP-16 MI	RJ-45 Back of hub	all ports (1-16)	only ports 1-8	only ports 1-8	software

All of the serial ports on the ESP-2 MI, ESP-4 MI and ESP-8 MI hubs may be configured to support the following physical interfaces:

- RS-232 DTE signaling
- RS-422 signaling (default)
- RS-485 2-wire half duplex (HD) signaling

On ESP-16 MI hubs, the first eight serial ports (ports 1-8) may be configured to support any of the physical interfaces noted above. The remaining eight ports (ports 9-16) are dedicated RS-232 ports.

By default, RS-232 is enabled on all serial ports.

For ESP-2 MI hubs, internal jumper settings select the physical interface for each port. See *Changing the Serial Port Interface on ESP-2 MI Hubs* on page 75.



For ESP-4 MI, ESP-8 MI and ESP-16 MI hubs, the physical interface can be changed in software, using any of the available tools.

- Web interface - see *Displaying or Changing the Serial Port Physical Interface* on page 34.
- Configuration utility - see *Displaying or Changing the Serial Port Physical Interface* on page 48.
- Configuration file - see *Port Interface Command* on page 57.

## Termination

When the RS-422 or RS-485 interface is enabled for a serial port, you may also enable/disable 100 ohm termination of the differential receive signal pair on that port. This termination is typically used in RS-485 environments when the device is the first or last on a multi-drop line for a 2-wire configuration. This termination should always be set when the hub is configured for RS-422, as this is a point-to-point configuration.

If your configuration includes supplying your own external termination, the termination on the hub should not be used.

On ESP-2 MI hubs, termination is enabled or disabled in hardware; see *Changing the Serial Port Interface on ESP-2 MI Hubs* on page 75. On ESP-4 MI, ESP-8 MI and ESP-16 MI hubs, termination is enabled or disabled using any of the available tools.

## RS-485 transmitter and receiver transfer modes

On ESP-4 MI, ESP-8 MI and ESP-16 MI hubs, the RS-485 physical interface always uses the ADDC (Automatic Data Detection Control) transfer mode. The transmitter is enabled and the receiver is disabled when a space (zero) bit is sent. The transmitter is disabled and the receiver is enabled when a mark (one) is sent. This allows rapid turnaround and release of the data pair.

On ESP-2 MI hubs, the RS-485 physical interface can use the ADDC or RTS (Request to Send) transfer mode. In RTS mode, the transmitter is enabled and the receiver is disabled when RTS is true. The transmitter is disabled and the receiver is enabled when RTS is false. The RS-485 transfer mode on ESP-2 MI hubs may be specified using any of the available tools.

## Serial port pin assignments

Serial port pin assignments are provided on a label on the bottom of the hub.

Table 2.3 lists the pin assignments for the RS-232 interface.

**Table 2.3: RS-232 Serial Port Pin Assignments**

Pin Number	RS-232	Description	Direction
1	DCD	Data Carrier Detect	Input
2	RxD	Receive Data	Input
3	TxD	Transmit Data	Output

**Table 2.3: RS-232 Serial Port Pin Assignments (Continued)**

Pin Number	RS-232	Description	Direction
4	DTR	Data Terminal Ready	Output
5	GND	Ground	N/A
6	DSR	Data Set Ready	Input
7	RTS	Request to Send	Output
8	CTS	Clear to Send	Input
9	N/C	N/C	N/A

Not supported: RI, RS-422 RTS and CTS differential control signals.

Unused pins (labeled N/C) should not have wires attached to them. Floating wires could cause unbalanced noise, shorten overall distances and degrade performance.

Table 2.4 lists the pin assignments for the RS-422 and RS-485 interfaces.

**Table 2.4: RS-422 and RS-485 Serial Port Pin Assignments**

Pin Number	RS-422/485 *	Description	Direction
1	RxD (+)	Receive Data (pos)	Input
2	RxD (-)	Receive Data (neg)	Input
3	TxD (+)	Transmit Data (pos)	Output
4	TxD (-)	Transmit Data (neg)	Output
5	GND	Ground	N/A
6	DSR (RS-232)	Data Set Ready (remains RS-232)	Input
7	RTS * (RS-232)	Request to Send (remains RS-232) *	Output
8	CTS * (RS-232)	Clear to Send (remains RS-232) *	Input
9	N/C	N/A	N/A

\* The RS-485 interface is implemented by using special cables that connect RxD(+) to TxD(+) and RxD(-) to TxD(-), thus providing the 2-wire bidirectional interface. In addition, pins 7 and 8 should be jumpered together to signal that the port is configured for RS-485. Pins 7 and 8 should be left open for an RS-422 configuration.

## Network Interface

The Ethernet port supports 10/100 auto detect (speed and duplex) connections. The LAN connector accepts 10BaseT or 100BaseT LAN interface cable. On an ESP-2 MI or ESP-4 MI hub, the LAN connector is on the front of the hub. On an ESP-8 MI or ESP-16 MI hub, the LAN connector is on the back of the hub. A CAT 5 cable is required for 100BaseT operation.

Table 2.5 lists the pin assignments for the RJ-45 shielded Ethernet connector.

**Table 2.5: Ethernet Connector Pin Assignments**

Pin	Signal
1	Transmit Data +
2	Transmit Data -
3	Receive Data +
4	*
5	*
6	Receive Data -
7	*
8	*

\* These pins are usually connected in a standard Ethernet CAT 5 cable. Special termination for these signals is in the interface to eliminate any problems if they are connected.

The network interface speed may be configured with the following values.

Auto-negotiate	
10 Mb/second half or full duplex	100 Mb/second half or full duplex
10 Mb/second half duplex	100 Mb/second half duplex
10 Mb/second full duplex	100 Mb/second full duplex

By default, auto-negotiate and all settings are enabled. The setting that will be used is determined by which settings are available and also by priority. For a standard CAT 5 twisted pair cable, the priority is (from highest to lowest):

- 100 Mb/second, full duplex
- 100 Mb/second, half duplex
- 10 Mb/second, full duplex
- 10 Mb/second, half duplex

The network interface speed may be specified using any of the available tools.

- Web interface - see *Displaying or Changing Network Configuration Values* on page 32.
- Configuration utility - see *Displaying or Changing Network Configuration Values* on page 45.
- Configuration file - see *Network Command* on page 59.

## Electrical

Table 2.6 describes the electrical connector information for the ESP serial hubs. For electrical specifications, see *Technical Specifications* on page 73.

**Table 2.6: ESP Serial Hub Electrical Connectors**

Model	Electrical Connector
ESP-2 MI	<p>Two electrical power connectors are located on the front of the hub under the label POWER 9-30 VDC 4W. You may use either one of the connectors, but not both.</p> <p>The hub ships with an external power adaptor. This adaptor includes a barrel plug that is inserted into the left power connector.</p> <p>The hub also contains a 3-pin screw terminal block connector which provides connection for a 9-30 VDC power source. The locations of the positive, ground and negative pins are printed next to the connector.</p> <p>Surge protection is provided for each serial port up to 15,000 volts electrostatic discharge (ESD).</p>
ESP-4 MI	<p>The power connector is located on the front of the hub. An external universal 5 VDC power supply, which must be provided by Avocent, has a standard IEC AC input connector that accepts power cords with country-dependent plugs.</p> <p>Surge protection is provided for every signal on each serial port and meets or exceeds the applicable European CE Immunity Standards.</p>
ESP-8 MI and ESP-16 MI	<p>An AC line cord connector is located on the back of the hub. The hub ships with an 18 AWG three-wire cable, with a three-lead IEC-320 receptacle on the power supply end and a country dependent plug on the power resource end.</p>

## Installing the Hub

All ESP hubs ship ready to use in a tabletop environment.

ESP-2 MI hubs may be installed on a DIN rail. Contact your Avocent representative for information about an Industrial Mounting Kit.

ESP-8 MI and ESP-16 MI hubs may be rack mounted.

You may replace an existing ESP hub with a similarly configured hub without affecting the server or having to reconfigure the ports.

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**NOTE:** The power outlet should be near the equipment and be easily accessible.

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**NOTE:** ESP-8 MI and ESP-16 MI hubs are not user serviceable. To avoid electric shock, do not attempt to open the unit or operate with the cover off. Do not attempt to make any repairs. See *Technical Support* on page 80 for information.

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## Startup

### To initiate the startup sequence:

1. The MAC address is printed on a label on the hub. This address is used as a Unit ID to distinguish different ESP hubs on the network. Record the MAC address.  
00 - \_\_\_\_ - \_\_\_\_ - \_\_\_\_ - \_\_\_\_ - \_\_\_\_
2. Attach a 10BaseT or 100BaseT LAN interface cable to the LAN connector on the hub. A CAT 5 cable is required for 100BaseT operation. Then, attach the other end of the LAN interface cable to the Ethernet hub or switch.
3. Connect devices to the serial ports on the hub, using appropriate cables (and adaptors, if needed).
4. Attach the electrical power connector to the hub, and then to an appropriate power source.

## Configuring network information

Configuring network information includes setting the IP address, subnet mask and gateway. You may also change the network interface setting (see *Network Interface* on page 9 for more information).

### To configure network information:

- Using the web interface - You may initially access the hub using the predefined IP address (see *Accessing the Web Interface* on page 31), then configure the network information (see *Displaying or Changing Network Configuration Values* on page 32).
- Using the configuration utility - The configuration utility is automatically enabled on port 1. Using a terminal emulation program of your choice (with a serial connection at 19200 baud, 8 bits, no parity and one stop bit), you may access the configuration utility on this port (see *Accessing the Configuration Utility* on page 43). Then, configure the network information (see *Displaying or Changing Network Configuration Values* on page 45).
- Using the serial port redirection connection method - Install the ESP drivers included on the SuperSerial CD (be sure to check the Avocent web site, [www.avocent.com](http://www.avocent.com), for the latest version).

You may also use the ESP-Install program with a script file to automate the installation; see *ESP-Install Program* on page 61.

- Using a configuration file - If you are using a configuration file with a BootP or DHCP server, consult your operating system documentation to determine how to configure the BootP or DHCP server.
  - After the ESP hub acquires an IP address (by any method), it will no longer use BootP or DHCP. Therefore, you cannot change the network values using this method.
  - The ESP hub requires a permanent IP allocation. If you are using DHCP, it must have an infinite lease on the assigned IP address; an IP address with a finite lease will not be accepted.

The BootP or DHCP server may also specify a configuration file using the “bootfile” parameter. See Chapter 6, beginning on page 55, for more information.

## After startup and address configuration

After the ESP serial hub’s network information has been configured, you may configure each of the ports. Most port operations may be initiated for one port or all ports.

### To configure ports:

- Using the web interface - see *Displaying or Changing Serial Port Attributes* on page 33, *Displaying or Changing Port Connection Methods* on page 33 and *Displaying or Changing the Serial Port Physical Interface* on page 34.
- Using the configuration utility - see *Displaying or Changing Serial Port Attributes* on page 46, *Displaying or Changing Connection Methods* on page 46 and *Displaying or Changing the Serial Port Physical Interface* on page 48.
- Using a configuration file - see *Port Interface Command* on page 57, *Port Connection Method Commands* on page 57 and *Port Attributes Command* on page 58.

## When Changes Take Effect

When you change values, the ESP serial hub’s memory is updated immediately. Some changes take effect immediately; others take effect when the next connection is established with a port or after the hub is rebooted.

Table 2.7 indicates when each type of change takes effect.

**Table 2.7: When Changes Take Effect**

Action	Immediately	On next connection	After reboot
Network address changes (IP, gateway, subnet)			X
Network interface speed	X		
Enabling/disabling the hub’s configurable features			X
Changing a port’s physical interface	X		
Enabling/disabling a port’s connection methods		X	
Changing a port’s attributes		X	
Updating a Flash image			X
Downloading a configuration file			X

Changing a web interface/configuration utility password takes effect the next time the web interface or the configuration utility is accessed.

## Reinitializing and Resetting the Hub

The information in this section is not a standard part of the startup sequence; however, it is provided for reference if the ESP serial hub must be reinitialized or reset.

### Reinitializing

The INIT button on the front of the hub may be used to remove configured information from an ESP hub. The hub stores nonvolatile data such as the SNMP community name, admin password, system contact and IP address in memory. This information is erased by pressing and holding the INIT button until reinitialization occurs.

When the INIT button is first pressed, the *ONLINE* LED will begin to blink to confirm that you have pressed the INIT button. As the INIT button remains pressed, the *ONLINE* LED will blink at a faster rate. After approximately 12 seconds, the *ONLINE* LED will turn off. At this point, all nonvolatile information will be reset to the factory defaults and the hub will immediately reboot.

You may also reinitialize the hub using the web interface (see *Reinitializing the Hub* on page 41) or the configuration utility (see *Reinitializing the Hub* on page 51).

### Resetting

The RESET button on the front of the hub may be used to reset the serial hub.

- On ESP-2 MI and ESP-4 MI hubs, pressing this button will cause an immediate reboot.
- On ESP-8 MI and ESP-16 MI hubs, pressing and holding this button for approximately one second will cause an immediate reboot if the master application is running. If the master application is not able to run (that is, only the bootloader is operational), pressing the RESET button will have no effect. However, if this condition persists for more than 15 seconds, the watchdog timer will cause the hub to reset.

You may also reset (reboot) the hub using the web interface (see *Rebooting the Hub* on page 41) or the configuration utility (see *Rebooting the Hub* on page 51).





## CHAPTER

## 3

## ***Connection Methods, Attributes and Configurable Features***

This chapter describes:

- Connection methods, which are configured for each serial port
- Attributes, which are configured for each serial port
- Configurable features, which are enabled/disabled for the entire hub

### **Serial Port Connection Methods**

There are several methods to access a serial port on an ESP hub.

- Serial port redirection - see page 16
- Telnet server - see page 16
- Raw TCP server - see page 17
- Raw TCP client - see page 19
- Modem emulation - see page 21
- Configuration utility - see page 28

You may configure port connection methods using any of the available tools.

- Web interface - see *Displaying or Changing Port Connection Methods* on page 33
- Configuration utility - see *Displaying or Changing Connection Methods* on page 46
- Configuration file - see *Port Connection Method Commands* on page 57

#### **Exclusivity and restrictions**

Each connection method may be enabled or disabled for each ESP port. A port may have multiple connection methods enabled, with the following exceptions.

- The raw TCP client connection method is exclusive; when it is enabled on a port, no other connection methods can be enabled for that port. (Conversely, if other connection methods are enabled for a port, you cannot enable the raw TCP client connection method on that port until you disable the other methods.)
- If you enable the raw TCP server connection method and enable the idle TCP buffering option on a port, then the TCP server connection method becomes exclusive; no other connection methods can be enabled for that port.

- The modem emulation connection method is valid only on an RS-232 port. This method is exclusive; when it is enabled on a port, no other connection methods can be enabled for that port.

In any case, a port may be actively open and used by only one method at a time.

## Serial port redirection

The serial port redirection connection method uses an ESP serial redirection driver on a host computer to communicate with the hub. The driver creates a virtual COMM or TTY port interface within the host's operating system.

Table 3.1 describes this method's configurable items for each serial port.

**Table 3.1: Serial Port Redirection Configurable Items**

Item	Description
Enable/disable	Enables or disables the serial port redirection connection method on the serial port. (See <i>Exclusivity and restrictions</i> on page 15.) The default value is enabled.
Serial buffering	Specifies the length of time accumulated serial data should be buffered before being sent to the remote server. Valid values are 0-65535 hundredths of a second. A 0 value indicates that data will be sent as soon as it is available. For example, a value of 100 indicates that once serial data is received, it will remain buffered up to 1 second (100 hundredths of a second), at which time all data will be sent. If the buffer becomes half full, the time is ignored and the data is sent. The default value is 0 (send immediately).

To use the serial port redirection connection method, you must install drivers on the host computer. See the SuperSerial CD for information. You may also use the ESP-Install program; see *ESP-Install Program* on page 61.

## Telnet server

The Telnet server connection method allows a user to make a Telnet connection to a serial port on the ESP hub and then transmit/receive data using the standard Telnet protocol. This method is also known as reverse Telnet.

When this method is enabled, the Telnet server within the hub will accept a connection from any valid remote IP address. There is no filtering of remote addresses. The connection will be accepted only if the port is not already open and in use by any connection method, including an existing Telnet session on that port. If the port is currently in use, the connection request will be rejected.

The Telnet session will remain established until the remote client ends the session, the Telnet TCP socket is broken or the inactivity time-out (if enabled) occurs.

Table 3.2 describes this method's configurable items for each serial port.

**Table 3.2: Telnet Server Connection Method Configurable Items**

Item	Description
Enable/disable	Enables or disables the Telnet server connection method on the port. (See <i>Exclusivity and restrictions</i> on page 15.) The default value is disabled.
Local IP port number [base]	Specifies the IP port number on which the Telnet server will listen. If the <i>all ports</i> option is being used for configuration, this value specifies the local IP port base. Each port's actual local IP port number will be the base plus the port number. For example, if 6000 is specified as the base, the local IP port number for port 1 will be 6001, port 2 will be 6002 and so on. This value (or its result when using the <i>all ports</i> option) must meet the following criteria: <ul style="list-style-type: none"> <li>• It cannot conflict with the port numbers specified for other enabled connection methods on any port.</li> <li>• Valid values are 1024-65535, except 4000 and 4100, which are reserved.</li> <li>• When using the <i>all ports</i> option, 4000 or 4100 may be used as the base. However, you cannot specify a base that, when added to a port number, will equal 4000 or 4100.</li> </ul> When using the <i>all ports</i> option, all ports must be valid or the entire selection will not be accepted. The default value is 3001 for port 1, 3002 for port 2 and so on.
Inactivity time-out	Specifies the length of time before the Telnet session is disconnected if there is no activity. Valid values are 0-65535 seconds. A 0 value disables the inactivity time-out. For example, a value of 60 indicates the Telnet session will be disconnected if there is no activity for a period of 60 seconds. The default value is 0 (disabled).
Serial buffering	Specifies the length of time accumulated serial data should be buffered before being sent across the network to the Telnet client. Valid values are 0-65535 hundredths of a second. A 0 value indicates that data will be sent as soon as it is available. For example, a value of 100 indicates that once serial data is received, it will remain buffered up to 1 second (100 hundredths of a second), at which time all data will be sent. If the buffer becomes half full, the time is ignored and the data is sent. The default value is 0 (send immediately).

## Raw TCP server

The raw TCP server connection method allows a remote client to make a TCP socket connection to a serial port on the ESP hub and then transmit/receive data using standard TCP. The remote client initiates the TCP session, using a predefined IP port number.

When this method is enabled, the TCP server will accept a connection from any valid remote IP address. There is no filtering of remote addresses. When a remote raw TCP client attempts to establish a connection, the raw TCP server will accept the connection only if the port is not already

open and in use by any connection method, including an existing raw TCP server connection on that port. If the port is currently in use, the connection request will be rejected.

The TCP session will remain active until the remote client closes the TCP socket, the TCP connection is broken or the inactivity time-out (if enabled) occurs.

Table 3.3 describes this method's configurable items for each serial port.

**Table 3.3: Raw TCP Server Connection Method Configurable Items**

Item	Description
Enable/disable	<p>Enables or disables the raw TCP server connection method on the port. (See <i>Exclusivity and restrictions</i> on page 15.)</p> <p>The default value is disabled.</p>
Local IP port number [base]	<p>Specifies the IP port number on which the TCP server will listen.</p> <p>If the <i>all ports</i> option is being used for configuration, this value specifies the local IP port base. Each port's actual local IP port number will be the base plus the port number. For example, if 6000 is specified as the base, the local IP port number for port 1 will be 6001, port 2 will be 6002 and so on.</p> <p>This value (or its result when using the <i>all ports</i> option) must meet the following criteria:</p> <ul style="list-style-type: none"> <li>• It cannot conflict with the port numbers specified for other enabled connection methods on any port.</li> <li>• Valid values are 1024-65535, except 4000 and 4100, which are reserved.</li> <li>• When using the <i>all ports</i> option, 4000 or 4100 may be used as the base. However, you cannot specify a base that, when added to a port number, will equal 4000 or 4100.</li> </ul> <p>When using the <i>all ports</i> option, all ports must be valid or the entire selection will not be accepted.</p> <p>The default value is 4001 for port 1, 4002 for port 2 and so on.</p>
Inactivity time-out	<p>Specifies the length of time before the TCP session is disconnected if there is no activity. Valid values are 0-65535 seconds. A 0 value disables the inactivity time-out.</p> <p>For example, a value of 60 indicates the TCP session will be disconnected if there is no activity for a period of 60 seconds.</p> <p>The default value is 0 (disabled).</p>
Monitor DCD	<p>(Valid only on RS-232 ports.) Enables or disables monitoring of the DCD signal, which is an indication that a serial device is attached and powered on. When enabled, the TCP server will refuse the TCP connection if the inbound DCD signal is logically low at the time the connection is initiated. If the inbound DCD signal changes from logically high to low while a TCP session is active, the TCP connection will be closed.</p> <p>The default value is disabled.</p>

**Table 3.3: Raw TCP Server Connection Method Configurable Items (Continued)**

Item	Description
Serial buffering	<p>Specifies the length of time accumulated serial data should be buffered before being sent to the remote server. Valid values are 0-65535 hundredths of a second. A 0 value indicates that data will be sent as soon as it is available.</p> <p>For example, a value of 100 indicates that once serial data is received, it will remain buffered up to 1 second (100 hundredths of a second), at which time all data will be sent. If the buffer becomes half full, the time is ignored and the data is sent.</p> <p>The default value is 0 (send immediately).</p>
Idle TCP buffering	<p>Enables or disables buffering of received serial data while waiting for a TCP connection to be established. When enabled, the most recent 20K bytes of data are held in an internal buffer. After the connection is established, the buffered serial data is sent to the TCP client.</p> <p>When this option and this connection method are enabled, you may not enable any other connection method for the port.</p> <p>The default value is disabled.</p>

## Raw TCP client

The raw TCP client connection method allows the ESP hub to make a TCP-based connection to a remote server and then transmit/receive data using standard TCP. The client hub initiates the TCP session.

When this method is enabled, the raw TCP client will attempt to establish a connection with the configured server when the connection mode requirement has been satisfied. The TCP session will remain active until the client closes the TCP socket, the TCP connection is broken, the inactivity time-out (if enabled) occurs or if the connection mode is *Connect on DCD* and the DCD signal is lowered.

Table 3.4 describes this method's configurable items for each serial port.

**Table 3.4: Raw TCP Client Connection Method Configurable Items**

Item	Description
Enable/disable	<p>Enables or disables the raw TCP client connection method on the port. (See <i>Exclusivity and restrictions</i> on page 15.)</p> <p>The default value is disabled.</p>
Destination IP address	<p>Specifies the IP address of the raw TCP server. This is a required item; there is no default value. Only one destination address can be configured for each serial port. The address cannot be 0.0.x.x, 127.x.x.x, 192.1.1.1, 248-255.x.x.x or the IP address of the ESP hub.</p>

**Table 3.4: Raw TCP Client Connection Method Configurable Items (Continued)**

Item	Description						
Destination IP port number [base]	<p>Specifies the IP port number on which the remote server is listening. Valid values are 0-65535. (If the destination IP port is on an ESP hub, 4000 and 4100 should not be used.)</p> <p>If the <i>all ports</i> option is being used for configuration, this value specifies the destination IP port base. Each port's actual destination IP port number will be the base plus the port number. For example, if 6000 is specified as the destination IP port base, the destination IP port number for port 1 will be 6001, port 2 will be 6002 and so on.</p> <p>The default value is 4001 for port 1, 4002 for port 2 and so on.</p>						
Local IP port number [base]	<p>Specifies the IP port number for the embedded TCP client.</p> <p>If the <i>all ports</i> option is being used for configuration, this value specifies the local IP port base. Each port's actual local IP port number will be the base plus the port number. For example, if 6000 is specified as the base, the local IP port number for port 1 will be 6001, port 2 will be 6002 and so on.</p> <p>This value (or its result when using the <i>all ports</i> option) must meet the following criteria:</p> <ul style="list-style-type: none"> <li>It cannot conflict with the port numbers specified for other enabled connection methods on any port.</li> <li>Valid values are 1024-65535, except 4000 and 4100, which are reserved.</li> <li>When using the <i>all ports</i> option, 4000 or 4100 may be used as the base. However, you cannot specify a base that, when added to a port number, will equal 4000 or 4100.</li> </ul> <p>When using the <i>all ports</i> option, all ports must be valid or the entire selection will not be accepted.</p> <p>The default value is 4001 for port 1, 4002 for port 2 and so on.</p>						
Inactivity time-out	<p>Specifies the length of time before the TCP session is disconnected if there is no activity. Valid values are 0-65535 seconds. A 0 value disables the inactivity time-out.</p> <p>For example, a value of 60 indicates the TCP session will be disconnected if there is no activity for a period of 60 seconds.</p> <p>The default value is 0 (disabled).</p>						
Connection mode	<p>Specifies the criteria for establishing the TCP connection. Valid values are:</p> <table border="0"> <tr> <td>Always Connect</td><td>Always attempt to establish the TCP connection.</td></tr> <tr> <td>Connect on Data</td><td>The TCP connection will be established upon receiving the first data character from the serial port.</td></tr> <tr> <td>Connect on DCD</td><td>(Valid only on RS-232 ports.) The TCP connection will be established when the DCD signal is logically high.</td></tr> </table> <p>The default value is Always Connect</p>	Always Connect	Always attempt to establish the TCP connection.	Connect on Data	The TCP connection will be established upon receiving the first data character from the serial port.	Connect on DCD	(Valid only on RS-232 ports.) The TCP connection will be established when the DCD signal is logically high.
Always Connect	Always attempt to establish the TCP connection.						
Connect on Data	The TCP connection will be established upon receiving the first data character from the serial port.						
Connect on DCD	(Valid only on RS-232 ports.) The TCP connection will be established when the DCD signal is logically high.						
Serial buffering	<p>Specifies the length of time accumulated serial data should be buffered before being sent to the remote server. Valid values are 0-65535 hundredths of a second. A 0 value indicates that data will be sent as soon as it is available.</p> <p>For example, a value of 100 indicates that once serial data is received, it will remain buffered up to 1 second (100 hundredths of a second), at which time all data will be sent.</p> <p>If the buffer becomes half full, the time is ignored and the data is sent.</p> <p>The default value is 0 (send immediately).</p>						

**Table 3.4: Raw TCP Client Connection Method Configurable Items (Continued)**

Item	Description
Idle TCP buffering	<p>Enables or disables buffering of received serial data while waiting for a TCP connection to be established. When enabled, the most recent 20K bytes of data are held in an internal buffer. Once the connection is established, the buffered serial data is sent to the remote endpoint of the TCP connection.</p> <p>The default value is disabled.</p>

## Modem emulation

ESP serial hubs may be used to replace costly POTS-line calls with cost-effective raw TCP sessions. To accomplish this, the ESP hub provides a connection method called modem emulation. Two ESP hubs work in conjunction to emulate the connection. One ESP hub will establish the connection in response to AT commands. The other ESP hub will emulate a modem that has received an incoming call.

The modem emulation connection method enables an ESP hub serial port to emulate modem dial and answer functionality. The hub presents a Hayes-compatible modem interface to the attached serial device by accepting AT modem commands and performing the required functions.

This connection method is valid only on RS-232 ports. For information about available adaptors that can be used with modem emulation, see *Adaptors* on page 77.

Table 3.5 describes this method's configurable items for each serial port.

**Table 3.5: Modem Emulation Connection Method Configurable Items**

Item	Description
Enable/Disable	<p>Enables or disables the modem emulation connection method on the port. (See <i>Exclusivity and restrictions</i> on page 15.)</p> <p>The default value is disabled.</p>
Allow Incoming Calls	<p>Enables or disables incoming calls (that is, raw TCP sessions originating remotely). When enabled, the ESP hub will listen for inbound raw TCP connection requests. See <i>Incoming calls</i> on page 28 for more information.</p> <p>The default value is enabled.</p>
Auto Answer	<p>(Used only when Allow Incoming Calls is enabled.) Enables or disables auto answer. When enabled, a connection will be accepted without interaction with the serial port. When disabled, the ESP hub will send the appropriate string (RING or 2, depending on the ATV command or configured Verbose Response value). Upon receipt of an ATA modem command, the call will be accepted.</p> <p>The default value is enabled.</p>

**Table 3.5: Modem Emulation Connection Method Configurable Items (Continued)**

Item	Description
Local IP Port [base]	<p>(Used only when Allow Incoming Calls is enabled.) Specifies the port where the ESP hub will listen for incoming connection requests.</p> <p>If the <i>all ports</i> option is being used for configuration, this value specifies the local IP port base. Each port's actual local IP port number will be the base plus the port number. For example, if 6000 is specified as the base, the local IP port number for port 1 will be 6001, port 2 will be 6002 and so on.</p> <p>This value (or its result when using the <i>all ports</i> option) must meet the following criteria:</p> <ul style="list-style-type: none"> <li>• It cannot conflict with the port numbers specified for other enabled connection methods on any port.</li> <li>• Valid values are 1024-65535, except 4000 and 4100, which are reserved.</li> <li>• When using the <i>all ports</i> option, 4000 or 4100 may be used as the base. However, you cannot specify a base that, when added to a port number, will equal 4000 or 4100.</li> </ul> <p>When using the <i>all ports</i> option, all ports must be valid or the entire selection will not be accepted.</p> <p>The default value is 5001 for port 1, 5002 for port 2 and so on.</p>
Allow Outgoing Calls	<p>Enables or disables outgoing calls (that is, establishing a raw TCP connection in response to AT commands received on the serial port). When this option is enabled, you may also set the Default IP Address and Default IP Port options, which will be used if an ATDT modem command is issued without parameters. When this option is disabled, valid ATDT strings will be ignored. See <i>Outgoing calls</i> on page 26 for more information.</p> <p>The default value is enabled.</p>
Destination IP Address	<p>(Used only when Allow Outgoing Calls is enabled.) Specifies the IP address to be used when an ATDT modem command is entered without an IP address. The address cannot be 0.0.x.x, 127.x.x.x, 248-255.x.x.x or the IP address of the ESP hub.</p>
Destination IP Port [base]	<p>(Used only when Allow Outgoing Calls is enabled.) Specifies the IP port number to be used when an ATDT modem command is entered without an IP port. Valid values are 0-65535. (If the destination IP port is on an ESP MI hub, 4000 and 4100 should not be used.)</p> <p>If the <i>all ports</i> option is being used for configuration, this value specifies the destination IP port base. Each port's actual destination IP port number will be the base plus the port number. For example, if 6000 is specified as the destination IP port base, the destination IP port number for port 1 will be 6001, port 2 will be 6002 and so on.</p> <p>The default value is 5001 for port 1, 5002 for port 2 and so on.</p>
Echo	<p>Enables or disables echo mode. When enabled, modem commands are echoed to the attached serial device. When disabled, modem commands are not echoed. (This option affects only modem commands, not session data.)</p> <p>The default value is enabled.</p> <p>This option is equivalent to an ATE modem command. If an ATE command is issued with a different value, the new value will be used during that connection but it will not replace this configured value. The configured Echo value will be used for subsequent connections.</p>



**Table 3.5: Modem Emulation Connection Method Configurable Items (Continued)**

Item	Description
Verbose Response	<p>Specifies whether text or numeric codes will be sent to the serial device in response to modem AT commands and how unknown commands will be handled. Valid values are:</p> <p>ATV0 - text codes will be used; unknown commands will cause an error</p> <p>ATV1 - numeric codes will be used; unknown commands will cause an error</p> <p>ATV2 - numeric codes will be used; unknown commands will be discarded</p> <p>ATV3 - text codes will be used; unknown commands will be discarded</p> <p>The default value is ATV0.</p> <p>Table 3.7 on page 26 lists the numeric and text codes.</p> <p>This option is equivalent to issuing an ATV modem command. If an ATV command is issued with a different value, the new value will be used during that connection but it will not replace this configured value. The configured Verbose Response value will be used for subsequent connections.</p>
Response Codes	<p>Specifies whether response codes will be displayed on the serial device. Valid values are:</p> <p>ATQ0 - response codes will be displayed (enabled)</p> <p>ATQ1 - response codes will not be displayed (disabled)</p> <p>The default value is ATQ0 (enabled).</p> <p>This option is equivalent to issuing an ATQ modem command. If an ATQ command is issued with a different value, the new value will be used during that connection but it will not replace this configured value. The configured Response Codes value will be used for subsequent connections.</p>
Monitor DCD	<p>Enables or disables monitoring of the DCD signal. When enabled, if the inbound DCD signal is logically low, the ESP hub will not allow the TCP session to be created. If the inbound DCD signal changes from logically high to low while a session is active, the connection will be closed.</p> <p>The default value is disabled.</p>
Serial buffering	<p>Specifies the length of time accumulated serial data should be buffered before being sent to the remote server. Valid values are 0-65535 hundredths of a second. A 0 value indicates that data will be sent as soon as it is available.</p> <p>For example, a value of 100 indicates that once serial data is received, it will remain buffered up to 1 second (100 hundredths of a second), at which time all data will be sent.</p> <p>If the buffer becomes half full, the time is ignored and the data is sent.</p> <p>The default value is 0 (send immediately).</p>
Inactivity time-out	<p>Specifies the length of time before the TCP session is disconnected if there is no activity. Valid values are 0-65535 seconds. A 0 value disables the inactivity time-out.</p> <p>For example, a value of 60 indicates the session will be disconnected if there is no activity for a period of 60 seconds.</p> <p>The default value is 0 (disabled).</p>

## Modem commands

Table 3.6 lists the supported AT modem commands. All other AT commands will be ignored or cause an error, depending on the configured response code and verbose response settings. With the exception of the ? and ATDT commands, multiple commands may be entered on the same line, separated by a space. (If a question mark is entered on a line with other commands, it is interpreted as AT?. If an ATDT command is followed by other commands on the same line, ATDT will be recognized, but the remaining commands on the line will be ignored.)

Information about command mode follows the table.

**Table 3.6: Modem Commands**

Command	Description
?	Help. Displays a list of valid AT commands.
AT?	Returns the value of register S0.
ATA	Instructs the ESP hub to answer an incoming call.
ATDT<ip>[,<socket>]	<p>Initiates a TCP connection to the specified host. A comma, period or nothing may be used to separate IP address octets. TCP ports may be delimited by a comma or colon.</p> <p>For example, the following commands are all valid:</p> <p>ATDT 10,100,128,129:3001</p> <p>ATDT 10.100.128.129,3001</p> <p>ATDT 010100128129:3001</p> <p>The IP address and socket number are required unless they were configured when the modem emulation connection method was enabled; see <i>Modem Emulation Connection Method Configurable Items</i> on page 21.</p> <p>The dialout translation feature may be enabled to translate from an input string (usually a telephone number) to an IP address/IP port; see <i>Dialout translation</i> on page 27.</p>
ATE	<p>Enables (ATE0) or disables (ATE1) echo mode. The default value is ATE1.</p> <p>This command is equivalent to the Echo option that is specified when configuring the modem emulation connection method. If you issue this command with a value that differs from the configured option value, the new value will override the configured value only for this connection. Subsequent connections will use the configured Echo option value.</p>
ATH	Disconnects the network session. The ESP hub will close the active TCP session and return the appropriate code (No Carrier or 3), depending on the ATV value.
ATO	Returns the ESP hub to data mode. When the hub returns to data mode, it once again listens for incoming data from the ESP hub at the other end of the connection. The remote hub will then send any data it may have stored.
ATQ	<p>Enables (ATQ0) or disables (ATQ1) response codes. The default value is ATQ0.</p> <p>This command is equivalent to the Response Codes option that is specified when configuring the modem emulation connection method. If you issue this command with a value that differs from the configured option value, the new value will override the configured value only for this connection. Subsequent connections will use the configured Response Codes option value.</p>

**Table 3.6: Modem Commands (Continued)**

Command	Description
ATS0=n	Sets the value in register S0, which specifies the number of rings before auto answer. The default value is 1.
ATV	<p>Specifies whether text or numeric codes will be returned in response to modem AT commands and how unknown commands will be handled. Valid values are:</p> <p>ATV0 = text codes will be used, unknown commands cause an error</p> <p>ATV1 = numeric codes will be used, unknown commands cause an error</p> <p>ATV2 = numeric codes will be used, unknown commands discarded</p> <p>ATV3 = text codes will be used, unknown commands discarded</p> <p>The default value is ATV0.</p> <p>Table 3.7 on page 26 lists the numeric and text codes.</p> <p>This command is equivalent to the Verbose Response option that is specified when configuring the modem emulation connection method. If you issue this command with a value that differs from the configured option value, the new value will override the configured value only for this connection. Subsequent connections will use the configured Verbose Response option value.</p>
+++	Activates command mode when entered from the serial port during a remote host connection. See <i>Command mode</i> on page 25 for more information.

If the Verbal Response/ATV value is set to 0 or 1, any AT command other than those listed in Table 3.6 will cause an ERROR or 4 response string to be sent to the attached serial device. Any commands parsed up to the point of the unknown command will be processed. Commands on the same line after the unknown command will not be processed.

For example, in the following command, V1 will be accepted, &W1 will cause an error and E0 will not be processed.

```
AT V1 &W1 E0
```

However, if the Verbal Response/ATV value is set to 2 or 3, unknown commands will be ignored/discarded. Commands on the same line after the unknown command, if valid, will be processed. In the previous example, V1 and E0 will be accepted; &W1 will be discarded.

### Command mode

When an ESP hub serial port is configured for the modem emulation connection method but no TCP connection is established, the port is in command mode. When an ATDT command is received and a session is established, the port is in data mode. Data from the network endpoint will be forwarded to the serial port and data from the serial port will be forwarded to the network endpoint.

The data being received from the serial port is scanned for the string that activates command mode (+++). When this string is detected, the hub will reply OK to the device and will enter command mode.

The following rules must be followed to enter command mode.

- There must be a one-second guard time (no data traffic) before sending the +++.
- There must not be a delay longer than one second between each +.
- There must be another one-second guard time after the last +.

When a port enters command mode, the remote ESP hub will not be aware of this state change. The remote hub will obviously not be receiving any data from the TCP connection, but if it receives serial data from its attached device, it will attempt to send it to the ESP hub that is not listening because it is in command mode. In this case, the data will be buffered until the port on the intended recipient ESP hub returns to data mode.

## Response codes

The ESP hub will respond to an AT command from the serial device with *OK* or *ERROR* plus the status of the TCP connection to the remote endpoint.

Table 3.7 lists the possible response values; that is, when response codes are enabled and the applicable format (numeric or text) is enabled.

**Table 3.7: Modem Command Response Codes**

Numeric Codes (ATV1 or ATV2)	Text Code (ATV0 or ATV3)
0	OK
2	Ring
3	No Carrier
4	Error
5	Connect
6	No Dialtone
7	Busy
8	No Answer

## Outgoing calls

When the Allow Outgoing Calls option is enabled and the ESP hub is idle, input will be parsed for valid ATDT strings and a TCP connection will be attempted to the remote end. If another call is active, any connection request will be ignored, even if the Escape to Command Mode string (+++) is detected.

If the Monitor DCD option is enabled, the connection will be rejected if the control signal is logically low. The connection will be closed if the inbound control signal transitions from logically high to low during the call.

In all cases, when a TCP connection is active, the ESP hub will raise the outbound DTR signal to indicate that the connection is valid (which should be seen as inbound DCD by the serial device,

which is usually a PC when modem emulation is used). If the TCP connection drops, DTR will be lowered to indicate a Carrier Drop to the attached serial device.

### Dialout translation

When the Allow Outgoing Calls option is enabled, the attached serial device usually specifies the IP address and IP port number of the remote application with the ATDT command. However, some devices that attach to modems may be unable to specify the IP address. In these cases, the ESP hub modem emulation provides an optional phone number translation mechanism for dialout applications.

A dialout translation set consists of a translate string (usually containing all or part of a telephone number), an IP address and an IP port. You may configure up to eight translation sets for each ESP hub serial port.

When an ATDT command is received, the modem emulation code first checks each of the eight dialout translation sets. If the translate string is non-null, it is compared against the ASCII data received after the ATDT command (that is, the target string). If it matches, an outgoing connection is made to the specified IP address and IP port, instead of the target string. Dialout is only done on the first translation set that matches the target string.

Table 3.8 lists the valid values for a translation set's parts.

**Table 3.8: Dialout Translation Set**

Translation Set Part	Description
Translate_string	<p>A string of from 1-16 printable ASCII characters. The string may contain the following wildcard characters:</p> <ul style="list-style-type: none"><li>? - to match any single ASCII character</li><li>* - to match multiple ASCII characters, including null characters</li></ul> <p>Examples of translate strings are:</p> <p>1800-5551234</p> <p>180055512??</p> <p>1800*4</p> <p>A null string creates a disabled translation set, and no other information (IP address/port) is required.</p> <p>The default is a null string.</p>
IP address	<p>IP address of the remote application, in standard dot notation. The address cannot be 0.0.x.x, 127.x.x.x, 248-255.x.x.x or the IP address of the ESP hub.</p> <p>The default is 0.0.0.0.</p>
IP port	<p>IP port number in the range 0-65535. If the destination IP port is on an ESP MI hub, 4000 and 4100 should not be used.</p> <p>The default is 0.</p>

The translation sets are configured when the modem emulation connection method and outgoing calls are enabled.

## Incoming calls

When the Allow Incoming Calls option is enabled, the ESP hub will listen on the specified TCP port for connection requests from the network. If another call is active, an incoming connection request will be rejected.

If the Monitor DCD option is enabled, the connection will be rejected if the control signal is logically low. The connection will be closed if the inbound control signal changes from logically high to low.

When a TCP connection is active, the ESP hub will raise the outbound DTR signal to indicate that the connection is valid (which should be seen as inbound DCD by the serial device). If the remote end breaks the TCP connection, DTR will be lowered to indicate a Carrier Drop to the attached serial device.

## Configuration utility

The configuration utility connection method may be used on any of the ESP serial ports. Using the internal configuration utility, you may specify attributes of the ESP hub and its serial ports. This includes enabling serial port connection methods and specifying their configurable items, plus configuring serial port attributes. The menu-based interface also allows you to configure network parameters, download and install Flash images, reboot, reinitialize and monitor ESP hub status. For more information, see Chapter 5, beginning on page 43.

Table 3.9 describes this method's configurable items for each serial port.

**Table 3.9: Configuration Utility Connection Method Configurable Items**

Item	Description
Enable/disable	Enables or disables the configuration utility connection method on the port. (See <i>Exclusivity and restrictions</i> on page 15.) The default value is enabled for port 1 and disabled for other ports.
Inactivity time-out	Specifies the length of time before the configuration utility is disconnected if there is no activity. Valid values are 0-65535 seconds. A 0 value disables the inactivity time-out. For example, a value of 60 indicates the configuration utility will be disconnected if there is no activity for a period of 60 seconds. The default value is 0 (disabled).

## Serial Port Attributes

Each serial port has a set of attributes. You may change the attribute values using any of the available tools.

- Web interface - see *Displaying or Changing Serial Port Attributes* on page 33
- Configuration utility - see *Displaying or Changing Serial Port Attributes* on page 46
- Configuration file - see *Port Attributes Command* on page 58

**NOTE:** When a port is configured for the serial port redirection connection method, the attributes are specified within the protocol. Therefore, although you may change the attributes, any changes you specify will not take effect.

Table 3.10 lists the serial port attributes with their valid and default values.

**Table 3.10: Serial Port Valid and Default Values**

Attribute	Valid and Default Values
Baud rate	Valid values: 50, 75, 110, 134, 150, 200, 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 76800, 115200 and 230400 * Default value: 19200 * The 230400 baud rate is not supported on ESP-8 MI or ESP-16 MI hubs. On ESP-2 MI hubs, the aggregate rate of both ports cannot exceed 230400.
Bits per character (size)	Valid values: 5, 6, 7 and 8 Default value: 8
Parity	Valid values: None, Even, Odd, Mark and Space Default value: None
Stop bits	Valid values: 1 and 2 Default value: 1
Flow control	Valid values: None, XON/XOFF and RTS/CTS Flow control settings are full duplex. RTS/CTS flow control is valid only on RS-232 ports. Default value: None

## Configurable Features

The Configurable Features display includes the current settings of the features described in Table 3.11.

You may enable/disable these features using any of the available tools.

- Web interface - see *Displaying or Changing Configurable Features* on page 37
- Configuration utility - see *Displaying or Changing Configurable Features* on page 50
- Configuration file - see *Configurable Features Commands* on page 59

When the ESP serial hub is reinitialized, all configurable features are restored to their default setting (enabled).

**Table 3.11: Configurable Features**

Feature	Description
Acquire IP address via DHCP	When enabled, the IP address may be set using DHCP/BootP. When disabled, the IP address must be set using the web interface, the configuration utility or the UDP protocol (espcfg or NT driver coinstaller). The default value is enabled.

**Table 3.11: Configurable Features (Continued)**

Feature	Description
Allow administrative functions via SNMP	When enabled, the SNMP interface is used for monitoring and limited configuration of the ESP hub. When disabled, tools such as espdiag will not work. The default value is enabled.
Allow web based interface	When enabled, the web interface may be used. When disabled, that interface is not available. The default value is enabled.
Allow Telnet to configuration utility	When enabled, the configuration utility may be accessed with Telnet. When disabled, the configuration utility is not accessible with Telnet. The default value is enabled.
Allow sockets based network administration	When enabled, the sockets-based interface for administrative functions such as the ESP-View diagnostic utility may be used. When disabled, those administrative functions cannot be used. The default value is enabled.



## CHAPTER

## 4

## Web Interface

You may use a standard web browser to access the ESP hub embedded web server. Any browser that supports frames may be used, and the web interface is accessible from any system, regardless of operating system type.

For information about when changes take effect, see *When Changes Take Effect* on page 12.

### Accessing the Web Interface

The web interface may be accessed using any standard web browser with the IP address of the hub as the URL. For example, if an ESP serial hub has an IP address of 192.168.0.5, entering the URL **http://192.168.0.5** will connect to the web interface.

The ESP-8 MI and ESP-16 MI serial hubs also support secure connections to the web interface. For example, with an ESP-16 MI hub with an IP address of 192.168.0.5, entering **https://192.168.0.5** will initiate a secure connection. The browser will display the security certificate (self-signed) from the ESP hub. Once the certificate is accepted, the web interface will open.

If the hub still has a default IP address (because it has not yet been configured or the hub has been reinitialized), you may enter the URL **http://192.1.1.1** to access the hub (or **https://192.1.1.1** for a secure connection to an ESP-8 MI or ESP-16 MI hub).

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**NOTE:** The predefined IP address (192.1.1.1) is fixed, and unexpected errors may occur if another device has the same IP address or if there is more than one uninitialized ESP hub on the network. After the hub's web interface is accessed, you must configure an IP address before the hub becomes operational. After the IP address is configured, the hub will no longer be accessible with the predefined IP address.

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The ability to access the web interface is a configurable feature which is enabled by default; see *Configurable Features* on page 29.

If you click the *Documentation* link in the Main Menu, you may then choose to download a copy of this document (Installer/User Guide) or a sample configuration file.

### Passwords

The web interface requires an administration password for access. When the ESP serial hub ships (and after it is reinitialized), there is no configured password. When you access the hub, you are prompted for a username and password. The username field is ignored. If a password has not yet

been set, any alphanumeric password will be accepted. Once you enter the web interface, you will be required to configure a password before requesting any other operations.

Some browsers have a feature to remember the password. If this is enabled, you will not need to enter the password at the username/password prompt in future sessions.

The administration password is common between the web interface and the configuration utility. When using the web interface, the password is encrypted by the browser when it is sent to the interface (regardless of whether the web interface connection is secure).

If you reinitialize the serial hub, the password is lost. You will be required to create a password the next time you access the web interface or the configuration utility.

**To set or change the password:**

1. From the Main Menu, select *Change Password*.
2. Enter the new 5-32 character password in the New Password field. Passwords are case sensitive and may contain any alphanumeric characters.
3. Repeat the new password in the New Password (re-enter) field.
4. Click *Apply*.

Once the password is validated, the configuration will be updated. A reboot is not required. The new password will be required the next time the web interface or the configuration utility is accessed.

## Displaying or Changing Network Configuration Values

The Network Configuration display includes the ESP serial hub IP address, subnet mask, gateway address and network interface settings. You must configure a nondefault IP address for the hub to become operational.

**To display or change network configuration values:**

1. From the Main Menu, select *Network Configuration*.
2. To change an entry, enter a valid value in the IP Address, Subnet Mask, Gateway Address and/or Interface Mode fields.

Addresses must be entered in standard IP dot notation. The gateway address must be in the same subnet as the IP address. You cannot set the IP address to: a Class A address of 0.0.x.x, a loopback address of 127.x.x.x, the default value of 192.1.1.1 or an address at or above 248.x.x.x. The subnet mask cannot be 0.0.0.0.

The default interface setting value is auto-negotiate. To change it, select another value from the listbox. See *Network Interface* on page 9 for more information.

3. If you changed any values, click *Apply*. If you changed the address information, it will not take effect until the next reboot of the ESP hub. To reboot, click *Reboot*. If the IP address had not been previously set or the hub has been reinitialized, the hub reboots automatically.

## Displaying or Changing Serial Port Attributes

You may display or change the attributes of one or all ESP hub serial ports. See *Serial Port Attributes* on page 28 for more information.

### To display or change serial port attributes:

1. From the Main Menu, select *Port Attributes*. The Serial Port Selection window will open.
2. Select a port number or *all ports*, then click *Apply*. The Serial Attributes window will open.
  - If a single port was selected, the display contains the current values of the port's attributes.
  - If *all ports* was selected, the display contains the default values for the port attributes, which may differ from the current values for any port.
3. To change any of the attributes, select a value from the appropriate listbox. See Table 3.10 on page 29 for valid and default values.
4. If you changed any values, click *Apply*. The change will take effect during the next connection to that port.

### Warnings and errors

A warning will be displayed (but the change will be allowed) if hardware flow control is specified for a port that is not configured with the RS-232 interface. If the change was applied to all ports, the warning will indicate the affected ports.

## Displaying or Changing Port Connection Methods

You may display or change the port connection methods for one or all ESP hub serial ports. See *Serial Port Connection Methods* on page 15 for more information.

### To display or change port connection methods:

1. From the Main Menu, select *Port Connections*. The Serial Port Selection window will open.
2. Select a port number or *all ports*, then click *Apply*. The Connection Methods window will open. Radio buttons indicate if a connection method is enabled or disabled. Text boxes contain values for applicable features.
  - If a single port was selected, the display contains the current values of the port's connection methods.
  - If *all ports* was selected, the display contains the default values for the connection method parameters, which may differ from the current values for any port.
3. To change a field, click the appropriate radio button, enter a valid value or choose from a listbox. Table 4.1 indicates where to find more information.

**Table 4.1: Reference to Connection Method Rules and Values**

For this method	See this table for descriptions, rules and values
Serial port redirection	Table 3.1 on page 16
Telnet server	Table 3.2 on page 17
Raw TCP server	Table 3.3 on page 18
Raw TCP client	Table 3.4 on page 19
Modem emulation	Table 3.5 on page 21
Configuration utility	Table 3.9 on page 28

4. If you enable the modem emulation connection method and enable outgoing calls, you may also configure dialout translation by clicking the *Configure Dialout Translation* link.  
The dialout translation table for that port will be displayed. You may configure up to eight sets for each port. For each set, enter a translate string, an IP address and a port number. A null string disables that translation set. If you changed any values, click *Apply*.  
See *Dialout translation* on page 27 for more information.
5. If you changed any values, click *Apply*. You will be prompted to confirm. When confirmed, the configuration is updated immediately. The change will take effect during the next connection to that port.

### Warnings and errors

A warning will be displayed (and the change will not be allowed) if:

- The TCP client or modem emulation connection method is enabled and any other connection method is also enabled.
- The TCP server connection method is enabled, the idle buffering feature is enabled and any other connection method is also enabled.
- There is a conflict on the local IP ports between two or more enabled connection methods.

A warning will be displayed (but the change will be allowed) if:

- The TCP server or TCP client connection method is enabled and monitor DCD is enabled, but the port interface is not RS-232.
- The modem emulation connection method is enabled but the port interface is not RS-232.

If changes were applied to all ports, the warning will indicate the affected ports.

## Displaying or Changing the Serial Port Physical Interface

You may change the physical interface for one or all serial ports on an ESP-4 MI or ESP-8 MI hub. On an ESP-16 MI hub, you may change the physical interface for one port or the first eight serial ports. See *Physical Interfaces* on page 6 for more information.

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**NOTE:** On ESP-2 MI hubs, the physical interface and termination are changed in hardware. See *Changing the Serial Port Interface on ESP-2 MI Hubs* on page 75 for more information.

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### To display or change the port interface:

1. From the Main Menu, select *Port Interface*. The Serial Port Selection window will open.
2. Select a port number or *all ports*, then click *Apply*.
  - On ESP-2 MI hubs, you may display interface information for port 1 or port 2 (the *all ports* option is not available). If the RS-485 interface was configured in hardware, you may change the transfer mode.
  - On ESP-16 MI hubs, ports 1-8 support multi-interface (ports 9-16 are dedicated RS-232), so only 1-8 will be displayed. If *all ports* is selected, only ports 1-8 will be affected.

The Serial Attributes window will open.

- If a single port was selected, the display contains the current port interface value.
  - If *all ports* was selected, the display contains the default port interface mode (RS-232), which may differ from the current values for any port.
3. To change the interface, select a value from the Port Interface listbox.
  4. If you select RS-422 or RS-485, you may also set a radio button in the RS422/RS485 Termination field to enable or disable 100 ohm termination. See *Termination* on page 7 for more information.
  5. For ESP-2 MI hubs configured for RS-485 in hardware, the Transfer Mode (RS485) field indicates the current transfer mode. (If the port is hardware-configured for another interface type, this field indicates Not Applicable.) To change the transfer mode, select *RTS* or *ADDC* from the listbox. See *RS-485 transmitter and receiver transfer modes* on page 7 for more information.
  6. If you changed the interface, click *Apply*. The change will take effect immediately.

### Warnings and errors

A warning will be displayed (but the change will be allowed) if the RS-422 or RS-485 interface is enabled and:

- Hardware flow control is enabled in the port attributes.
- Monitor DCD is enabled for the TCP server or TCP client connection methods, and those methods are enabled.
- Modem emulation is enabled.

If these changes were applied to all ports, the warning will indicate the affected ports.

## Sending a Break to a Port

The Send Break feature sends a line break to an attached device on one or all ports.

### To send a break to one or all ports:

1. From the Main Menu, select *Port Break*. The Serial Port Selection window will open.
2. Select a port number or *all ports*, then click *Apply*.

A break will be sent to the specified port(s).

## Displaying Hardware Information

The Hardware Information display includes the following items.

- Model number
- Hardware revision number
- Number of serial ports
- EEPROM revision number
- Amount of SDRAM in megabytes
- Amount of Flash memory in megabytes
- Amount of EEPROM configuration memory in kilobytes (ESP-2 MI and ESP-4 MI hubs only)
- Hub MAC address
- Hub serial number
- Hub part number

This information cannot be modified.

### To display hardware information:

Select *Hardware Information* from the Main Menu.

## Displaying or Updating Flash Memory

The Flash Update display includes information about the current images loaded in Flash memory. You may update the embedded application image or bootstrap image in Flash memory. Before updating a Flash image, you must configure a TFTP server on the target server system and install the new Flash image in the appropriate location, which is usually relative to the TFTP root directory.

### To display Flash image information or update an image:

1. From the Main Menu, select *Flash*.

The Application Image section includes the version number, size and internal slot number for the Primary embedded application image. The previously installed image is maintained as a backup; the Backup field contains its values.

The Bootstrap Image section indicates the version number, size and internal slot number for the embedded kernel image. The previously installed image is maintained as a backup. The Bootloader field indicates the version number and size of the bootloader image. The FPGA field indicates the version number and size of the FPGA.

2. To update the application image:
  - a. Click *Update Application*. The Application Image Update window appears.
  - b. Enter the IP address of the TFTP server and the application image filename.
  - c. Click *Apply*. The update process may take up to 30 seconds to complete. After the update completes, status will be displayed.
3. To update the bootstrap image:
  - a. Click *Update Bootstrap*. The Bootstrap Image Update window appears.
  - b. Enter the IP address of the TFTP server and the bootstrap image filename.
  - c. By default, the bootloader will only be updated if the version number of the new image is greater than the version number currently installed.  
 If you wish to downrev the bootloader (that is, use a previous/earlier version), enable the *Update Bootloader Regardless of Version* checkbox. It is generally recommended that this checkbox be disabled.
  - d. Click *Apply*. The update process may take up to 30 seconds to complete. After the update completes, status will be displayed.

The new Flash image will be used after the ESP serial hub reboots.

## Displaying or Changing Configurable Features

The Configurable Features display includes the current settings of the features described in Table 3.11 on page 29.

### To view or change configurable features:

1. From the Main Menu, select *Configurable Features*.
2. Click the *Enabled* or *Disabled* radio button next to the feature to be changed.
3. If you changed any setting, click *Apply*. The change will not take effect until the next reboot. To reboot, click the *Reboot* button.

When the ESP serial hub is reinitialized, all configurable features are restored to their default settings.

## Downloading a Configuration File

To ease the task of configuration, the ESP hub supports file-based configuration. The Configuration Download operation initiates the loading of a configuration file from a TFTP server. The commands in the file are processed and the configuration is then updated. See Chapter 6, beginning on page 55, for more information.

**To download and process a configuration file:**

1. From the Main Menu, select *Configuration File*.
2. Enter the TFTP server IP address and the pathname of the configuration file.

The outcome of the configuration update will be displayed. If an error occurred with the TFTP address or file pathname, the message will indicate a time-out condition. If an error was encountered in the configuration file, the display includes the command line number and the erroneous entry.

The Status from last operation field indicates the result of the previous unattended configuration operation. If that operation was successful, this field will be empty; if an error occurred, a message will be displayed.

The configuration is updated immediately, but some changes may not take effect until the next reboot. You are notified if this applies. To reboot immediately, click the *Reboot* button.

## Launching the ESP-View Diagnostic Utility

The ESP-View diagnostic utility may be used for datascope, loopback and status functions. See *ESP-View Diagnostic Utility* on page 67 for more information.

**To launch the ESP-View utility:**

From the Main Menu, select *Diagnostic Utility*.

## Displaying General Statistics

The General Statistics display includes the items described in Table 4.2. All values are cumulative since the ESP serial hub was last reset.

**Table 4.2: General Statistics Display**

Item	Description
Uptime	Number of days, hours, minutes and seconds since the hub was last rebooted.
Idle Time	Number of days, hours, minutes and seconds of idle time. Idle time occurs when the hub is not performing any active operations such as processing serial or network data.
Network Interface Counts	Number of bytes transmitted and received plus the number of transmit and receive errors that have occurred.
UDP	Number of UDP datagrams transmitted and received plus the number of UDP receive errors.
TCP	Number of TCP packets transmitted and received plus the number of TCP receive errors.



**To display general statistics:**

Select *General Statistics* from the Main Menu.

## Displaying Port Statistics

The Port Statistics display includes the information described in Table 4.3 for one or all ports. All values are cumulative since the ESP hub was last reset. This display refreshes every five seconds.

**Table 4.3: Port Statistics Display**

Item	Description
Status	Port status flags.
Destination IP Address	IP address of the server that has the port open.
Receive Bytes	Number of bytes received.
Transfer Bytes	Number of bytes transmitted.
Signals	Current value of the RS-232 signals: RTS, CTS, DTR, DSR and CD. A signal is listed in the display only if it is asserted (high).
Baudrate/Sz/Par/Stp	Baud rate, data size (5-8 bits), parity (N=none, O=odd, E=even, M=mark or S=space) and number of stop bits (1 or 2).
Frame/Parity/Overrun	Number of framing errors, parity errors and overruns.

**To display port statistics:**

1. Select *Port Statistics* from the Main Menu. The Serial Port Selection window will open.
2. Select a port number or *all ports*, then click *Apply*.

## Displaying Connection Status

The Connection Status display has two sections: Serial Port Active Connection Status and Port Redirection Connections. This display refreshes every five seconds.

The Serial Port Active Connection Status section includes the information described in Table 4.4 for one or all serial ports.

**Table 4.4: Serial Port Active Connection Status Display**

Item	Description
Serial Connection Method	Connection method: serial port redirection, Telnet server, TCP server, TCP client, modem emulation, configuration utility or idle. If a port is idle, no other values will be displayed.
Destination IP Address	IP address of the remote server.

**Table 4.4: Serial Port Active Connection Status Display (Continued)**

Item	Description
Bytes Received	Number of bytes received from the serial port since the current connection session was established.
Bytes Transmitted	Number of bytes transmitted on the serial port since the current connection session was established.
Connect Time	Number of days, hours, minutes and seconds that the current connection has been established.
Inactivity Timeout	Number of minutes and seconds in the configured inactivity time-out value for this session. If no time-out was configured, this field indicates <i>disabled</i> .
Time Remaining	Number of minutes and seconds remaining until the inactivity time-out occurs. If no time-out was configured, this field indicates <i>not applicable</i> .

The Port Redirection Connections section includes the information described in Table 4.5 about the servers that are connected to one or all of the ESP serial ports. This display is meaningful only when a serial port is being accessed using the serial redirection connection method.

**Table 4.5: Serial Port Redirection Connections Status Display**

Item	Description
Destination IP Address	Server's IP address.
UDP State	Current UDP connection state.
	Initiating      Server is establishing a connection.
	Active          Server and hub are connected.
	Timeout        Connection is being dropped due to lost communication with the server.
	Terminated    Connection has been dropped.
TCP State	Current TCP connection state.
	Initiating      Server is establishing a connection.
	Connected      Server and hub are connected.
	Terminated    Connection has been dropped.
Connect Time	Number of days, hours, minutes and seconds the server has been connected.
Timeout Period	UDP time-out value; that is, the amount of time before a connection is dropped if no heartbeat messages are received.

### To display connection status information for one or all ports:

1. Select *Connection Status* from the Main Menu. The Serial Port Selection window will open.
2. Select a port number or *all ports*, then click *Apply*.

## Rebooting the Hub

The Reboot operation reboots the ESP serial hub. A reboot is usually required for the following operations to take effect.

- Changing network address values
- Changing any configurable features
- Updating Flash
- Downloading a configuration file

### To reboot:

1. From the Main Menu, select *Reboot*.
2. Click *Reboot*.

After the reboot completes, the browser will try to reconnect to the hub. If this fails, or if the web interface does not return within 30 seconds, direct your browser to the ESP serial hub IP address.

You may also reboot the hub using the configuration utility (see *Rebooting the Hub* on page 51) or the RESET button on the front panel (see *Resetting* on page 13).

## Reinitializing the Hub

The Initialize operation resets all configurable values to their factory defaults, including the IP address and password.

### To reinitialize:

1. Click *Re-initialize* from the Main Menu.
2. Click *Reinitialize*.

After the reinitialization completes, the browser will try to reconnect to the hub, using the predefined IP address (192.1.1.1). If this fails, or if the web interface does not return within 30 seconds, direct your browser to the predefined IP address.

You may also reinitialize the serial hub using the configuration utility (see *Reinitializing the Hub* on page 51) or the INIT button on the front panel (see *Reinitializing* on page 13).



## CHAPTER

## 5

## Configuration Utility

The ESP serial hub has a built-in configuration utility that you may use to manage ESP hubs. For information about when changes take effect, see *When Changes Take Effect* on page 12.

### Accessing the Configuration Utility

The configuration utility may be accessed three ways: with Telnet, by serial connection to port 1 when the ESP serial hub has no configured IP address or by serial connection to the port(s) that have the configuration utility connection method enabled.

#### Accessing with Telnet

You may initiate a Telnet session to the IP address of the ESP serial hub and the standard Telnet port 23. For example, if a hub has an IP address of 192.168.0.5, entering **telnet 192.168.0.5 23** will connect to the configuration utility.

If the hub still has a default IP address (because it has not yet been configured or the hub has been reinitialized), you may use the predefined IP address of 192.1.1.1 to access the hub.

---

**NOTE:** The predefined IP address (192.1.1.1) is fixed, and unexpected errors may occur if another device has the same IP address or if there is more than one uninitialized ESP serial hub on the network. After the configuration utility is accessed, you must configure an IP address before the hub becomes operational. After the IP address is configured, the hub will no longer be accessible with the predefined IP address.

---

The ability to access the configuration utility with Telnet is a configurable option. By default, this option is enabled.

#### Accessing a hub with no configured IP address

The configuration utility is automatically enabled on port 1 after delaying several seconds to allow an IP address to be configured using DHCP/BootP. The port will be configured at 19,200 baud, 8 bits per character, no parity, 1 stop bit and no flow control. If the ESP serial hub already has an IP address or if the address is acquired through DHCP/BootP, this access method will not be active.

## Accessing on a port using the configuration utility connection method

After the ESP serial hub has a configured IP address, the administrator may enable the serial configuration utility on any serial port. When this connection method is enabled, the configuration utility will become active if the port is not in use and the **Enter** key is pressed three times in a row.

This access method is enabled on port 1 and disabled on other ports by default. You may enable/disable the configuration utility access method on each port using the configuration utility (see *Displaying or Changing the Serial Port Physical Interface* on page 48), the web interface (see *Displaying or Changing the Serial Port Physical Interface* on page 34) or a configuration file (see *Port Configuration Utility command* on page 58).

## About the Configuration Utility Interface

The configuration utility has a menu-based text interface. Each menu contains a numbered list of operations. When you enter the number associated with an operation and then press **Enter**, you are either presented with another menu containing a numbered list of operations or the selected command is initiated.

For example, the following is the Top Menu, which is displayed when you access the utility.

```
0 -> Server Configuration
1 -> Serial Port Attributes
2 -> Serial port connection methods
3 -> Port interface
4 -> Send break
5 -> Status
6 -> Debug
7 -> Change password
99 -> Exit
enter command :
```

If you enter **0** and then press **Enter**, the Server Configuration Menu appears. The following is an excerpt from the Server Configuration Menu:

```
0 -> Return to Top Menu
1 -> Network configuration
2 -> Flash status and update
3 -> Configurable features
4 -> Configuration File Download
5 -> Hardware information
6 -> Reboot
7 -> Re-Initialize (factory defaults)
99 -> Exit
enter command:
```

From the Server Configuration Menu, you may enter selection numbers for a desired operation, return to the Top Menu or exit the configuration utility.

The configuration utility will remain active until you enter the command to exit the utility (usually **99**). If the serial configuration utility connection method is used to access the utility and an inactivity time-out is enabled, a session will end if the inactivity period is reached.

## Passwords

The configuration utility requires an administration password for access. When the hub ships (or after it is reinitialized), there is no configured password. After you create a password, you will be prompted for it each time you access the configuration utility.

The administration password is common between the configuration utility and the web interface. No encryption is used when entering the password with the configuration utility.

If you reinitialize the ESP serial hub, the password is lost; you will be required to create a password the next time you access the configuration utility or the web interface.

### To set or change the password:

1. From the Top Menu, enter **7** to select Change password.
2. You are prompted for the new password. Enter a 5-32 character password. Passwords are case sensitive and may contain any alphanumeric characters.
3. You are prompted to re-enter the new password. Retype the new password. A confirmation message will appear.

## Displaying or Changing Network Configuration Values

The Network Configuration display includes the ESP serial hub IP address, subnet mask, gateway address and network interface settings. You must configure a nondefault IP address for the hub to become operational.

### To display or change network configuration values:

1. From the Top Menu, enter **0** to select Server Configuration. The Server Configuration Menu will be displayed.
2. Enter **1** to select Network configuration. The display shows the IP address, subnet mask, gateway address and interface setting.
3. You are prompted to modify any values. Enter **y** for yes or **n** for no.

To change an entry, enter a valid value when prompted. Addresses must be entered in standard IP dot notation. The gateway address must be in the same subnet as the IP address. You cannot set the IP address to: a Class A address of 0.0.x.x, a loopback address of 127.x.x.x, the default value of 192.1.1.1 or an address at or above 248.x.x.x. The subnet mask cannot be 0.0.0.0.

The default network interface setting is auto-negotiate. To change it, select another value from the listbox. See *Network Interface* on page 9 for more information.

4. If you changed any values, the new values are displayed and you are prompted to confirm the changes. Confirm or cancel the changes.

If you changed the address information, it will not take effect until the ESP hub is rebooted (see *Rebooting the Hub* on page 51). If the IP address had not been previously set or the hub has been reinitialized, the hub reboots automatically.

## Displaying or Changing Serial Port Attributes

You may display or change the attributes for one or all ESP hub serial ports. See *Serial Port Attributes* on page 28 for more information.

### To display or change serial port attributes for one or all ports:

1. From the Top Menu, enter **1** to select Serial port attributes. The Port Selection Menu will be displayed.
2. Enter the number corresponding to a port or **0** to select all ports.
  - If a single port was selected, the display contains the current values of the port's attributes.
  - If *all ports* was selected, the display contains the default values for the port attributes, which may differ from the current values for any port.
3. You are prompted to modify each attribute. Enter **y** for yes or **n** for no.  
If you choose to modify an attribute, a menu will be displayed (Table 3.10 on page 29 lists all valid and default values). Each attribute menu will contain a numbered list of valid values. Either enter the number corresponding to the desired value, or press **Enter** to leave the value unchanged.
4. When the port attribute menus are completed, you are prompted to confirm the changes. Confirm or cancel the changes.

### Warnings and errors

A warning will be displayed (but the change will be allowed) if hardware flow control is specified for a port that is not configured with the RS-232 interface. If the change was applied to all ports, the warning will indicate the affected ports.

## Displaying or Changing Connection Methods

You may display or change the connection methods for one or all ESP hub serial ports. See *Serial Port Connection Methods* on page 15 for more information.

### To display or change the connection methods for one or all ports:

1. From the Top Menu, enter **2** to select Serial port connection methods. The Port Selection Menu will be displayed.
2. Enter the number corresponding to a port or **0** to select all ports.
  - If a single port was selected, the display contains the current values of the port's connection method parameters.
  - If *all ports* was selected, the display contains the default values for the connection method parameters, which may differ from the current values for any port.



If a connection method is enabled, its configurable options are also displayed. If a method is disabled, no configurable options are displayed.

3. You are prompted to modify each connection method. Enter **y** for yes or **n** for no.

If you choose to modify the connection values, the utility will prompt for all connection parameters. The utility will prompt to enable each connection method, regardless of whether the method is currently enabled. Enter **y** for yes or **n** for no. If you reply no, nothing more is displayed for that connection method. If you reply yes (that is, you want to enable that method), the configurable parameters are displayed and you are prompted for values.

Table 5.1 indicates where to find more information.

**Table 5.1: Reference to Connection Method Rules and Values**

For this method	See this table for descriptions, rules and values
Serial port redirection	Table 3.1 on page 16
Telnet server	Table 3.2 on page 17
Raw TCP server	Table 3.3 on page 18
Raw TCP client	Table 3.4 on page 19
Modem emulation	Table 3.5 on page 21
Configuration utility	Table 3.9 on page 28

4. If you enable the modem emulation connection method and enable outgoing calls, you will be prompted for values for each of eight dialout translation sets. If you specify a null translate string for a set, that set will be disabled. See *Dialout translation* on page 27 for more information.
5. When the port connection method menus are completed, you are prompted to confirm any changes. Confirm or cancel the changes.

Warnings and errors

A warning will be displayed (and the change will not be allowed) if:

- The TCP client or modem emulation connection method is enabled and any other connection method is also enabled.
- The TCP server connection method is enabled, the idle buffering feature is enabled and any other connection method is also enabled.
- There is a conflict on the local IP ports between two or more enabled connection methods.

A warning will be displayed (but the change will be allowed) if:

- The TCP server or TCP client connection method is enabled and monitor DCD is enabled, but the port interface is not RS-232.
- The modem emulation connection method is enabled but the port interface is not RS-232.

If changes were applied to all ports, the warning will indicate the affected ports.

## Displaying or Changing the Serial Port Physical Interface

You may change the physical interface for one or all serial ports on an ESP-4 MI or ESP-8 MI hub. You may change the physical interface for one or the first eight serial ports on an ESP-16 MI hub. See *Physical Interfaces* on page 6 for more information.

---

**NOTE:** On ESP-2 MI hubs, the serial port interface and termination are changed in hardware. See *Changing the Serial Port Interface on ESP-2 MI Hubs* on page 75 for more information.

---

### To display or change the serial port interface:

1. From the Top Menu, enter **3** to select Port interface. The Port Selection Menu will be displayed.
2. Enter the number corresponding to a port or **0** to select all ports.
  - On ESP-2 MI hubs, you may display interface information for port 1 or port 2 (the *all ports* option is not available). If the RS-485 interface was configured in hardware, you may change the transfer mode.
  - On ESP-16 MI hubs, ports 1-8 support multi-interface (ports 9-16 are dedicated RS-232), so only 1-8 will be displayed. If *all ports* is selected, only ports 1-8 will be affected.

If a single port was selected, the display contains the current port interface value.

If *all ports* was selected, the display contains the default port interface mode (RS-232), which may differ from the current values for any port.

3. You are prompted to modify the interface. Enter **y** for yes or **n** for no.

If you choose to modify the interface, a numbered list of interface types will be displayed. Enter the number corresponding to the desired interface, or press **Enter** to leave the value unchanged.
4. If you entered a number corresponding to the RS-422 or RS-485 interface, you are prompted to enable or disable 100 ohm termination. Enter **y** for yes or **n** for no. See *Physical Interfaces* on page 6 for more information.
5. For ESP-2 MI hubs configured for RS-485 in hardware, you are prompted to modify the Transfer Mode (RS485). Enter the number corresponding to RTS or ADDC. See *RS-485 transmitter and receiver transfer modes* on page 7 for more information.
6. You are prompted to confirm changes. Confirm or cancel the changes.

### Warnings and errors

A warning will be displayed (but the change will be allowed) if the RS-422 or RS-485 interface is selected and:

- Hardware flow control is enabled in the port attributes.
- Monitor DCD is enabled for the TCP server or TCP client connection methods, and those methods are enabled.
- Modem emulation is enabled.

If these changes were applied to all ports, the warning will indicate the affected ports.

## Sending a Break to a Port

The Send Break feature sends a line break to an attached device on one or all ports.

### To send a break to a port:

1. From the Top Menu, enter **4** to select Send Break. The Port Selection Menu will be displayed.
2. Enter the number corresponding to a port or **0** to select all ports.
3. A break will be sent to the specified port(s), and a confirmation message will be displayed.  
Press any key to continue.

## Displaying Hardware Information

The Hardware Information display includes the following items.

- Model number
- Hardware revision number
- Number of serial ports
- EEPROM revision number
- Amount of SDRAM in megabytes
- Amount of Flash memory in megabytes
- Amount of EEPROM configuration memory in kilobytes (ESP-2 MI and ESP-4 MI hubs only)
- Hub MAC address
- Hub serial number
- Hub part number

This information cannot be modified.

### To display hardware information:

1. From the Top Menu, enter **0** to select Server Configuration. The Server Configuration Menu will be displayed.
2. Enter **5** to select Hardware Information.

## Displaying or Updating Flash Memory

The Flash Update display includes information about the current images loaded in Flash memory. You may update the embedded application image or bootstrap image in Flash memory. Before updating a Flash image, you must configure a TFTP server on the target server system and install the new Flash image in the appropriate location, which is usually relative to the TFTP root directory.

### To display Flash image information or update an image:

1. From the Top Menu, enter **0** to select Server Configuration. The Server Configuration Menu will be displayed.

2. Enter **2** to select Flash status and update.
3. All application and kernel image information is displayed (version, size and status), plus the FPGA version and size.
4. You are prompted to update the application image. Enter **y** for yes or **n** for no.  
If you indicate yes, you are prompted for the IP address of the TFTP server and the application image filename. After you enter these, the application image upgrade is initiated.
5. You are prompted to update the boot image. Enter **y** for yes or **n** for no.  
If you indicate yes, you are prompted for the IP address of the TFTP server and the boot image filename. You are also prompted to update the bootloader regardless of version. It is recommended that this option not be enabled (that is, enter **n**). After the prompts are answered, the boot image upgrade is initiated.

The new Flash image(s) will be used after the ESP hub reboots.

## Displaying or Changing Configurable Features

The Configurable Features display includes the current settings of the features described in Table 3.11 on page 29.

### To view or change configurable features:

1. From the Top Menu, enter **0** to select Server Configuration. The Server Configuration Menu will be displayed.
2. Enter **3** to select Configurable features.
3. The current state (enabled or disabled) of each feature is displayed, and the default value is shown in square brackets (enabled = [y], disabled = [n]).

You are prompted to enable each feature (even if the feature is already enabled). Enter **y** for yes or **n** for no.

For example, if the SNMP feature is currently enabled, you will be prompted to enable that feature. If you enter **y**, SNMP will remain enabled; if you enter **n**, SNMP will be disabled.

When the ESP serial hub is reinitialized, all configurable features are restored to their default settings.

## Downloading a Configuration File

To ease the task of configuration, the ESP hub supports file-based configuration. The Configuration Download operation initiates the loading of a configuration file from a TFTP server. The commands in the file are processed and the configuration is then updated. See Chapter 6, beginning on page 55, for more information.

### To download and process a configuration file:

1. From the Top Menu, enter **0** to select Server Configuration. The Server Configuration Menu will be displayed.

2. Enter **4** to select Configuration File Download.
3. You are prompted to specify the TFTP server IP address and the pathname of the configuration file. Enter those values.

The outcome of the configuration update will be displayed. If an error occurred with the TFTP address or file pathname, the message will indicate a time-out condition. If an error was encountered in the configuration file, the display includes the command line number and the erroneous entry.

The configuration is updated immediately, but some changes may not take effect until the next reboot. The display will indicate if a reboot is required.

## Rebooting the Hub

The Reboot operation reboots the ESP serial hub. A reboot is usually required for the following operations to take effect:

- Changing network address values
- Changing any configurable features
- Updating Flash
- Downloading a configuration file

### To reboot:

1. From the Top Menu, enter **0** to select Server Configuration. The Server Configuration Menu will be displayed.
2. Enter **6** to select Reboot.

You may also reboot the hub using the web interface (see *Rebooting the Hub* on page 41) or the RESET button on the front panel (see *Resetting* on page 13).

## Reinitializing the Hub

The Reinitialize operation resets all configurable values to their factory defaults, including the IP address and password.

### To reinitialize:

1. From the Top Menu, enter **0** to select Server Configuration. The Server Configuration Menu will be displayed.
2. Enter **7** to select Re-Initialize (factory defaults).

You may also reinitialize the hub using the web interface (see *Reinitializing the Hub* on page 41) or the INIT button on the front panel (see *Reinitializing* on page 13).

## Displaying General Statistics

The General Statistics display includes the items described in Table 4.2 on page 38. All values are cumulative since the ESP serial hub was last reset.

**To display general statistics:**

1. From the Top Menu, enter **5** to select Status. The Status Menu will be displayed.
2. Enter **1** to select General statistics.

## Displaying Port Statistics

The Port Statistics display includes the information described in Table 4.3 on page 39 for one or all ports. All values are cumulative since the ESP serial hub was last reset.

**To display port statistics:**

1. From the Top Menu, enter **5** to select Status. The Status Menu will be displayed.
2. Enter **2** to select Port statistics. The Port Selection Menu will be displayed.
3. Enter the number corresponding to a port or **0** to select all ports.

## Displaying Connection Status

The Connection Status display has two sections: Serial Port Active Connection Status and Port Redirection Connections.

The Serial Port Active Connection Status section includes the information described in Table 4.4 on page 39 for one or all ports.

The Port Redirection Connections section includes the information described in Table 4.5 on page 40 about the servers that are connected to one or all of the ESP serial ports. This display is meaningful only when a serial port is being accessed using the serial redirection connection method.

**To display connected server information:**

1. From the Top Menu, enter **5** to select Status. The Status Menu will be displayed.
2. Enter **3** to select Connection Status. The Port Selection Menu will be displayed.
3. Enter the number corresponding to a port or **0** to select all ports.

## Displaying and Using Debug Features

The Debug Menu contains commands to display or control log information, run the datascope feature or escape to a shell.

---

**NOTE:** Debug Menu commands should only be used on the advice of Avocent service personnel.

---

These debug operations are not available in the web interface. You may use the ESP-View diagnostic utility from the web interface; see *ESP-View Diagnostic Utility* on page 67.

**To display or control log information:**

1. From the Top Menu, enter **6** to select Debug. The Debug Menu will be displayed.
2. To display log information provided by the ESP hub applications, enter **1**.

3. To set the level of logging performed by the ESP hub applications, enter **2**. You may select a log level in the range of no logging to verbose.
4. To display log information provided by the ESP hub kernel, enter **3**.
5. To run the datascopes feature, enter **4**. You will be prompted to select a port. Once the port is selected, the datascopes function will run until you press any key on the keyboard.  
The datascopes shows all data sent and received on the specified serial port. Each line displays 16 bytes in hex and ASCII.
6. To escape to a shell, enter **5**. This feature requires a hardware jumper and should be used only on the advice of Avocent Technical Support.





## CHAPTER

## 6

## Configuration Files

The ESP serial hub will accept a DOS or UNIX style text file containing configuration commands. A configuration file may be loaded from a BootP or DHCP server for initial configuration. A download may also be initiated using the web interface or the configuration utility.

A file-based reconfiguration of an ESP hub may also be initiated using a third party SNMP agent. An SNMP MIB is available through Avocent Technical Support.

The configuration file is processed one line at a time. If an error is encountered, the line containing the error and all remaining lines in the file will be ignored. Commands in lines that were parsed before the errored line will be executed.

### Sample Configuration File

A sample configuration file is available through the web interface. This file contains every supported command with most of the required and optional parameters for one serial port. All lines are preceded by a comment character (#).

#### To use the sample configuration file as a template:

1. Access the web interface. See *Accessing the Web Interface* on page 31.
2. Select *Documentation* from the Main Menu.
3. On the Available Documentation page, enable the *Sample Configuration File* radio button, then click *Apply*. The sample file will be displayed.
4. Copy the sample file. You may either select and paste the content or save the frame to your system.
5. Using an editor of your choice, remove the comment character (#) from the beginning of each line containing a command you want to execute.
6. Following the rules listed in *File Format and Command Syntax* on page 56, tailor the required and optional parameters to meet your requirements. For example, if the sample command enables a feature and you want to disable it, replace the word *enable* with *disable*. Replace address and port parameters with values that are meaningful to your configuration.
7. Copy and edit the commands as needed to configure all serial ports.
8. Save the customized file.

## File Format and Command Syntax

Configuration files must conform to the following conventions:

- Each command must begin on a new line.
- Command words are not case sensitive.
- Parameters are separated by one or more spaces.
- Parameters with values that enable or disable connection methods or features use a space between the keyword and the value. For example:  

```
port 2 tcpserver enable monitorcd enable ipviadhcp disable
```
- When enabling/disabling a connection method, the Enable or Disable keyword must be the first parameter specified after the connection method name. Additional required or optional parameters may appear in any order following the Enable or Disable keyword.

For example, both of the following commands will result in the same connection method configuration for port 1.

```
port 1 telserver enable localipport=2000 timeout=400 buffering=10000
port 1 telserver enable buffering=10000 localipport=2000 timeout=400
```

- Parameters that include an equal sign and a value (for example Parity=Even) may not contain embedded spaces.
- If you want to enable a connection method that is mutually exclusive of other connection methods, and one or more of those other methods was enabled previously (either earlier in this or another configuration file, or through another tool such as the web interface or configuration utility), you should expressly disable the other connection method in the configuration file before enabling the mutually exclusive method.

For example, if you want to enable the modem emulation connection method on a port that currently has the TCP client connection method enabled, you must first disable the TCP client method:

```
port 1 tcpclient disable
port 1 modem enable . . .
```

- In commands that require a port number, you may specify **All** instead of a port number if you want the command to be applied to all serial ports on the hub. If you specify **All** in a Port Interface command, the operation will be applied to all multi-interface serial ports (all ports on an ESP-2 MI, ESP-4 MI or ESP-8 MI hub; ports 1-8 on an ESP-16 MI hub).
- If an optional parameter is not specified in a command, its value remains as is.

The command syntax in this manual uses the following conventions:

- Variables are shown in *italic* type surrounding by angle brackets (< >).
- Choices are separated by a vertical bar (|).
- Optional parameters are enclosed in brackets ([ ]).

## Port Interface Command

**NOTE:** On ESP-2 MI hubs, the serial port interface and termination are set in hardware. See *Changing the Serial Port Interface on ESP-2 MI Hubs* on page 75 for more information. However, if an ESP-2 MI hub is configured with the RS-422 or RS-485 interface, you may change the transfer mode with this command.

The Port Interface command specifies the physical interface for one or all ports. If the RS-422 or RS-485 interface is specified, you may enable or disable termination by including Termination Enable or Disable. Omitting the Termination keyword leaves the setting as is. See *Physical Interfaces* on page 6 for more information. The Transfer keyword and values are valid only for ESP-2 MI hubs.

```
PORT <port>|ALL INTERFACE=[RS232|RS422|RS485] [TRANSFER=RTS|ADDC]
[TERMINATION ENABLE|DISABLE]
```

## Port Connection Method Commands

The port connection method commands enable or disable connection methods to one or all ESP hub serial ports. See *Serial Port Connection Methods* on page 15 for information about enabling multiple connection methods.

### Port Redirection command

The Port Redirection command enables or disables the port redirection connection method on one or all serial ports. See Table 3.1 on page 16 for parameter descriptions and rules for use.

```
PORT <port>|ALL REDIRECT ENABLE|DISABLE [BUFFERING=<hsec>]
```

### Port Telnet Server command

The Port Telnet Server command enables or disables the Telnet server connection method on one or all serial ports. See Table 3.2 on page 17 for parameter descriptions and rules for use.

```
PORT <port>|ALL TELSERVER ENABLE|DISABLE
[LOCALIPPORT=<lport>] [TIMEOUT=<sec>] [BUFFERING=<hsec>]
```

### Port TCP Server command

The Port TCP Server command enables or disables the raw TCP server connection method on one or all serial ports. See Table 3.3 on page 18 for parameter descriptions and rules for use.

```
PORT <port>|ALL TCPSERVER ENABLE|DISABLE
[LOCALIPPORT=<lport>] [TIMEOUT=<sec>] [MONITORDCD ENABLE|DISABLE]
[BUFFERING=<hsec>] [IDLEBUFFERING ENABLE|DISABLE]
```

## Port TCP Client command

The Port TCP Client command enables or disables the raw TCP client connection method on one or all serial ports. See Table 3.4 on page 19 for parameter descriptions and rules for use.

```
PORT <port>|ALL TCPCLIENT ENABLE|DISABLE  
DESTIP=<dest_ip> [DESTPORT=<dest_port>] [LOCALPORT=<lport>]  
[CONNECTMODE=AUTO|DATA|DCD] [TIMEOUT=<sec>] [BUFFERING=<hsec>]  
[IDLEBUFFERING ENABLE|DISABLE]
```

## Port Modem Emulation command

The Port Modem Emulation command enables or disables the modem emulation connection method on one or all serial ports. See Table 3.5 on page 21 for parameter descriptions and rules for use.

```
PORT <port>|ALL MODEM ENABLE|DISABLE  
[INCOMING ENABLE|DISABLE] [AUTOANSWER ENABLE|DISABLE]  
[LOCALPORT=<port>] [OUTGOING ENABLE|DISABLE] [DESTIP=<ip_add>]  
[DESTPORT=<dest_port>] [ECHO ENABLE|DISABLE] [VERBOSE=0|1|2|3]  
[RESPONSECODES ENABLE|DISABLE] [MONITORDCD ENABLE|DISABLE]  
[BUFFERING=<hsec>] [TIMEOUT=<sec>]
```

## Dialout Translation command

The Dialout Translation command is used to translate telephone numbers to an IP address and IP port. This command is valid only when the modem emulation connection method is enabled and outgoing calls are enabled. You may configure up to eight sets for each ESP hub serial port. See *Dialout translation* on page 27 for more information.

```
DIALOUT_TRANSLATION PORT=<port>|ALL SET=<set_number>  
NUMBER=<translate_string> IPADDR=<ip_add> IPPORT=<dest_port>
```

## Port Configuration Utility command

The Port Configuration Utility command enables or disables the configuration utility connection method on one or all serial ports. See Table 3.9 on page 28 for parameter descriptions and rules for use.

```
PORT <port>|ALL CONFIGUTIL ENABLE|DISABLE [TIMEOUT=<sec>]
```

## Port Attributes Command

The Port Attributes command specifies attributes for one or all serial ports.

```
PORT <port>|ALL [BAUD=<baud>] [SIZE=<size>]  
[PARITY=NONE|EVEN|ODD|MARK|SPACE] [STOP=1|2]  
[FLOW=NONE|XON/XOFF|RTS/CTS]
```

See Table 3.10 on page 29 for serial port parameter descriptions and rules for use.

## Network Command

The Network command specifies the ESP hub’s network address and interface information.

```
NETWORK IP=<ip> MASK=<mask> GATEWAY=<gateway>
INTERFACE=AUTO|10|10HD|10FD|100|100HD|100FD
```

The addresses must be entered in standard IP dot notation. The gateway address must be in the same subnet as the IP address. You cannot set the IP address to: a Class A address of 0.0.x.x, a loopback address of 127.x.x.x, the default value of 192.1.1.1 or an address at or above 248.x.x.x. The subnet mask cannot be 0.0.0.0.

The interface value is used for the network connection. See *Network Interface* on page 9 for more information.

- AUTO = auto-negotiate

10 = 10 Mb/second, full or half duplex

10HD = 10 Mb/second, half duplex

10FD = 10 Mb/second, full duplex
- 100 = 100 Mb/second, full or half duplex

100HD = 100 Mb/second, half duplex

100FD = 100 Mb/second, full duplex

## Configurable Features Commands

Table 6.1 shows the syntax of the configurable features commands. Table 3.11 on page 29 describes each feature.

Table 6.1: Configurable Features Commands

Command Syntax	Description
IPVIADHCP ENABLE DISABLE	Enables or disables acquiring the IP address using DHCP.
ADMINVIASNMP ENABLE DISABLE	Enables or disables administrative functions using SNMP.
WEBINTERFACE ENABLE DISABLE	Enables or disables use of the web interface.
CONFIGVIATELNET ENABLE DISABLE	Enables or disables use of the configuration utility.
NETADMIN ENABLE DISABLE	Enables or disables the sockets-based interface for administrative functions such as the ESP-View diagnostic utility.

## Initiating a Configuration File Download

When used from a BootP or DHCP server, no user interaction is required to initiate a configuration file download if the hub does not have a unique IP address. Specify the configuration file as the “bootfile” option on the server. To use a DHCP server, the ESP hub must have an infinite lease on its assigned IP address.

If the hub has a unique IP address, the user must manually clear the IP address and then reboot the hub, or otherwise manually force the BootP request.

When using the web interface, follow the instructions in *Downloading a Configuration File* on page 37. When using the configuration utility, follow the instructions in *Downloading a Configuration File* on page 50.

## Completion Status

### **To verify the completion status of a configuration file download:**

If the web interface or the configuration utility was used to initiate the download of the configuration file, the completion status of the operation will be displayed.

If the configuration file download was initiated from BootP, DHCP or a third party SNMP agent, access the web interface (see *Accessing the Web Interface* on page 31), then select *Configuration File Download* from the Main Menu. Any errors will be posted in the Status from last operation field. If the last operation completed successfully, the field will be blank.

## CHAPTER

## 7

***ESP-Install Program***

The ESP-Install program may be used to install, modify and remove redirected serial ports and ESP drivers on supported Windows systems. By using a script file, you may streamline the process of installing multiple hubs. The program uses a series of commands (keywords and keyword/value pairs) to identify address information, assign logical COM ports to physical ports and specify other driver-related information.

You may also use this program to remove (uninstall) previously installed drivers for ESP serial hubs. A hub may be removed in the same script file that installs other ESP hubs. This allows you to update a driver without having to reboot the ESP hubs.

This chapter describes the available commands and how to use them. It is written for administrators who are familiar with Windows driver features and terminology.

## Running the ESP-Install Program

There are two ways to run the ESP-Install program at the command prompt.

- When you type **espinstall.exe** at the command prompt with no parameters, a help screen will be displayed. You may then enter commands to install one hub at a time.  
During this process, you may access help information by entering **espinstall /help**. You may generate a current list of port mappings by entering **espinstall /list**.
- To automate the installation process, you may specify a script file by entering **espinstall.exe /text <filename>** that contains all the commands to install up to 256 serial ports when you start the program. (If the script file is not located in the same subdirectory as the ESP-Install program, the <filename> parameter should specify the full pathname of the script file.)

The results of the ESP-Install program commands are written to the files ESPsummary.log (if the requested operations completed successfully) and ESPinstall.log, which are located in the same subdirectory as ESPinstall.exe.

- 0 = the command(s) completed successfully
- 2 = the ESP-Install program could not communicate with the ESP hub (check the Ethernet cable connection)
- 3 = an ESP hub with the specified address is already installed
- 8 = an error occurred

You may log additional information with the Debug and Windowdebug commands (see Table 7.1).

The ESP hubs do not have to be rebooted for changes to take effect.

## Creating Installation/Update Command Blocks

Installation or update information for an ESP serial hub is delimited using the terms ESP and END. The opening delimiter is ESP on a line by itself - this identifies the start of an installation block for a hub. The next command must be TYPE, which indicates the ESP hub model. You may then specify commands such as address information, logical port assignments and feature enabling/disabling. The closing delimiter for an ESP hub installation block must be END on a line by itself.

```
ESP
  TYPE
  .
  .
  .
END
```

For example, the following excerpt from a script file contains address and port assignment commands for an ESP-2 MI serial hub.

```
ESP
  TYPE = ESP-2 MI
  IP = 10.0.0.115
  MAC = 00-80-7D-94-65-00
  P1 = COM30
  P2 = COM40
END
```

### Type and address information

- The IP address (IP command) is mandatory to uniquely identify the ESP hub, even if the address is already assigned.
- The IP and MAC addresses (IP and MAC commands) are both required if the ESP hub does not yet have an IP address, but is installed on a local subnet.
- The IP, MAC, gateway and subnet addresses (IP, MAC, GATEWAY and SUBNET commands) are all required if the ESP hub does not yet have an IP address and the hub is not located on a local subnet.

You may specify an address even if it is not required. For example, if you are updating information for a previously defined ESP on the local subnet, you may include the MAC address, even though it is not required.

### Physical to logical port numbering

Each physical port number on the ESP hub must be mapped to a logical port number using a P command.

P<p\_port>=COM<l\_port>



For example, in the preceding ESP-2 hub example, physical port 1 was mapped to logical port COM30 and physical port 2 was mapped to logical port COM40. The specified logical (COM) port number must be in the range 0-255 and it must be unique; only one physical port may be assigned to a particular logical (COM) port number.

The current mapping may be obtained from the Windows Device Manager on the ESP property page and the Starting COM Port listboxes. A current list may also be generated by entering **espinstall /list**.

You may remap logical port numbers at any time, as long as they do not conflict with any existing mappings.

## Updating ESP Hub Configurations

You may use the ESP-Install program to update the information used by drivers for an ESP serial hub.

Update information for each hub is also specified within an ESP-END block. The first command is ESP. The IP and Type commands are required to identify the serial hub to update.

---

**NOTE:** If you wish to change a hub's IP address, the hub must first be initialized with no IP address.

---

Enter additional commands as needed to modify/update the configuration. The last command for each hub's block must be END.

Changes take effect immediately; you do not need to reboot the hub.

## Removing ESP Hubs

You may use the Remove command to uninstall/remove a previously installed ESP serial hub. The Remove command specifies the IP address of the hub to be removed. This command is issued outside of an ESP-END command block, but it may be included in a script file that also contains ESP-END command blocks that install/update hubs.

To update a driver without having to reboot the computer, you may remove information about all previously installed ESP hubs and then put it back, all in the same script file. This will also load a new esp.sys driver in the computer's memory. This provides an easy way to update a driver without having to reboot the computer when more than one ESP hub is installed.

### To remove and replace existing information:

1. Run **espinstall /list** to obtain a list of currently installed hubs.
2. Edit your original script file, adding a Remove command at the beginning of the file for each installed ESP hub.
3. Run **espinstall /text <filename>** on the edited file.

## Commands

Table 7.1 describes the commands that may be used in the ESP-Install program. Many of the commands contain detailed driver specifications; contact Technical Support for more information.

### Syntax conventions

Keywords and values are not case sensitive.

A command must start on a line by itself. A carriage return marks the end of a command.

A comment must be on a line by itself, and must be preceded with a double slash (/).

Keyword/value pairs may have intervening spaces for readability. For example, all of the following forms are valid:

```
type=esp-8                f1=sendmodemstatus off
type = esp-8              f1 = sendmodemstatus  off
```

**Table 7.1: ESP-Install Program Commands**

Command	Description
AUTO DEVICE ON OFF	Enables (ON) or disables (OFF) automatic responses for an unsigned driver. The default value is ON.
DEBUG=[0 1]	Enables (1) or disables (0) inclusion of addition debug information in the ESPinstall.log file. The default is enabled.
END	Designates the end of the installation/update commands for an ESP hub.
ESP	Designates the beginning of the installation/update commands for an ESP hub.
F<port>=NOFLUSH ON OFF	Enables (ON) or disables (OFF) the NOFLUSH feature for the specified physical port.
F<port>=NOPURGE ON OFF	Enables (ON) or disables (OFF) the NOPURGE feature for the specified physical port.
F<port>=SENDCOMMSTATUS ON OFF	Enables (ON) or disables (OFF) the SENDCOMMSTATUS feature for the specified physical port.
F<port>=SENDMODEMSTATUS ON OFF	Enables (ON) or disables (OFF) the SENDMODEMSTATUS feature for the specified physical port.
F<port>=TXDRAIN ON OFF	Enables (ON) or disables (OFF) the TXDRAIN feature for the specified physical port.
GATEWAY=<gateway>	Gateway address, in dot notation. This command is required when installing an ESP hub that does not yet have an IP address and is not located on the local subnet.
I<port>=RS-232 RS-485 RS-485RTS RS-422	Interface type of the physical port. This command is valid only on multi-interface hubs that support the specified interface type.

**Table 7.1: ESP-Install Program Commands (Continued)**

Command	Description
IP=<ip>	IP address, in dot notation. This command is required when adding a hub or modifying a hub's configuration.
MAC=<mac>	MAC address, in dash notation. This command is required when installing an ESP hub that does not yet have an IP address.
MASK=<mask>	Subnet mask, in dot notation. This command is required when installing an ESP hub that does not yet have an IP address and is not located on the local subnet.
ONEPORTOPTION	Enables the one port option. This command is valid only for ESP-2 MI hubs.
OPENPERSIST ON OFF	Enables (ON) or disables (OFF) the persistent open feature for this ESP hub.
P<p_port>=COM<l_port>	Physical port number (p_port) and unique logical port (l_port) mapping. The logical port must be in the range 0-255.  The current mapping may be obtained from the Windows Device Manager on the ESP property page and the Starting COM Port listboxes. A current list may also be generated by running espinstall /list.
RATE=<sec>	Specifies the heartbeat rate for the ESP hub, in the range 1-100.
REMOVE=<ip>	Removes a previously installed ESP hub. This command does not need to be inside an ESP-END block.
TIMEOUT=<sec>	Specifies the heartbeat time-out for the ESP hub. This value must be 3 times the heartbeat rate specified in the Rate command.
TYPE=<type>	ESP hub type. Valid values include ESP-2 MI, ESP-4 MI, ESP-8 MI and ESP-16 MI.
WINDOWDEBUG=[0 1]	Enables (1) or disables (0) inclusion of addition debug information in the ESPinstall.log file, related to the automated responses to the Windows dialogs for an unsigned driver. The default is disabled.

## Sample Script File

The following sample script file:

- Removes the driver information for the ESP hub with address 10.0.0.116.
- Installs the driver information for the ESP-2 MI hub with address 10.0.0.115.

This hub's MAC address is 00-80-7D-94-65-00. This hub is on the local gateway and subnet. Physical port 1 is mapped to logical port COM30, and physical port 2 is mapped to logical port COM40.

The interface for port 1 is RS-485 and the interface for port 2 is RS-232.

The heartbeat rate is 10 seconds and the heartbeat time-out is 80 seconds.

All other values (transmit drain, no flush, send modem status, send comms status, no purge and open persist) assume their default values.

- Updates (modifies) the driver information for the ESP-4 MI hub at address 10.0.0.117.

Physical port 3 is remapped to logical port COM100 and physical port 4 is remapped to logical port 110.

The transmit drain feature is disabled for port 1.

```
// The following command removes information about the ESP hub
// at IP address 10.0.0.116
remove=10.0.0.116
// The following commands provide driver installation information
// about the ESP hub at IP address 10.0.0.115
esp
  type = esp-2 mi
  ip = 10.0.0.115
  mac = 00-80-7d-94-54-00
  p1 = com30
  p2 = com40
  i1 = rs-485
  i2 = rs-232
  rate = 10
  timeout = 80
end
//The following commands update driver information for the ESP-4 MI
//serial hub at IP address 10.0.0.117.
esp
  type=esp-4 mi
  address=10.0.0.117
  p3=com100
  p4=com110
  f1=txdrain off
end
```

## CHAPTER

## 8

## ***ESP-View Diagnostic Utility***

The ESP-View diagnostic utility is launched from the web interface. This utility may be used for datascope, loopback and status functions.

### **Requirements**

- One of the following browsers:
  - Internet Explorer 6.0 with service pack 1 or later (Windows systems only)
  - Mozilla version 1.7.3 or later
  - Firefox version 1.0 or later
  - Netscape version 7.2 or later
- JRE (Java Runtime Environment) version 1.4 or higher on the system where the browser is being used.
- The sockets-based network administration configurable feature must be enabled. See *Configurable Features* on page 29 for more information.

## **Accessing and Exiting the ESP-View Utility**

### **To launch the ESP-View utility:**

1. Access the ESP hub web interface (see *Accessing the Web Interface* on page 31).
2. From the Main Menu of the web interface, select *Diagnostic Utility*.

The ESP-View utility will launch and the datascope will open.

### **To exit the ESP-View utility:**

From the ESP-View utility menu, select *File - Exit*.

## **Datascope**

The datascope function collects, displays and saves received data, transmitted data and control signals from an ESP serial hub. Only a single datascope session may be active at any one time on a hub.

You may display data from either the most recent collection session or from a previously saved session.

## Datascope window

The Settings panel contains listboxes for selecting the serial hub port number and the maximum number of the sample “buckets” in the buffer (see *Sample buckets* on page 69 for more information).

The main panel contains 16 rows of data during operation or review - 8 receive data rows and 8 transmit data rows, arrayed in Rx/Tx pairs. Each row contains 16 characters of hexadecimal data plus the equivalent ASCII characters. Nonprintable ASCII data is displayed as a period (.). Blanks are written in fields where no valid data exists.

The right panel contains a graphical display of a DB-9 connector that indicates the state of the control signals (red = low, green = high). The transmit and receive signals are always red. If control signals change between samples, the colors will change at the start of the next sample display.

When samples are being collected, the area under the connector display contains a timestamp, recorded in milliseconds at the beginning of each sample. During playback, timestamps are displayed relative to the start time of the datascope session, not the time of day or date. The accuracy of the timestamp is dependent on the Java Virtual Machine and the environment where the datascope is being used.

The display advances in real time. Data from the next sample follows the last received data, regardless of whether it was transmit or receive data.

Table 8.1 describes each of the buttons in the lower left panel (from left to right).

**Table 8.1: ESP-View Utility Datascope Window Buttons**

Button	Description
Beginning (double left arrow with bar)	Goes to the beginning of the table (view mode)
Reverse (double left arrow)	Goes up 16 rows in the table (view mode)
Play (right arrow)	Starts sample collection
Stop (square)	Stops sample collection and closes the connection
Pause (two bars)	Stops sample collection but maintains the connection, waiting for a command to resume or stop
Forward (double right arrow)	Goes forward 16 rows in the table (view mode)
End (double right arrow with bar)	Goes to the end of the table (view mode)

The counters in the lower right panel display the number of saved samples, the number of buffered receive data bytes and the number of buffered transmit data bytes.

The lower right panel will also contain a rotating circle when samples are being collected.

## How it works

A data request is sent to the ESP hub. The response may contain either receive or transmit data, but not both; it will also contain status. If data is available, it is read and saved in a receive or transmit data bucket. If there is no data available, the state of the control signals will be checked. If there was a control signal change, the sample will be saved, even if there is no data to save.

Once a successful sample is collected, the most recent status is checked to see if there is any more data pending to be read. If there is, the next sample is requested immediately. If not, a 50 millisecond delay is invoked before the next sample. This mitigates the amount of TCP traffic generated by the datascopes when the serial port is not busy.

## Sample buckets

Each sample is collected in a bucket that may contain up to 1024 characters, plus the corresponding control signals. Buckets are stored in a circular buffer. You may configure the maximum number of buckets in the buffer. If the maximum is exceeded, the oldest buckets are overwritten.

Data is saved only if there has been a change in state during the five second time-out interval, that is, if data has been transmitted or received or a change in the control signals is detected.

(Theoretically, if there is no data traffic on the serial interface, buckets could be filled with only control signals, and no data would be available for later analysis. This occurrence is unlikely, but possible.)

The sampling rate is driven by data or time-outs, not the control signals. It is therefore possible that multiple control signal transitions could occur and not be recorded. However, this prevents rapidly filling all the buckets if there is a floating signal or if many flow control transitions occur.

When data is being sampled, it is requested with a five second time-out. If there is no data movement and a sampling exchange returns due to a time-out, the state of the control signals is checked and compared to the previous sample. If the control signals have changed, a sample bucket will be filled with zero data and the new state of the control signals. So, even when there is no data traffic on the serial interface, the control signals will be checked every five seconds.

## To use the datascopes function:

1. Launch the ESP-View utility.
2. Click the *Datascopes* tab or select *Tools - Datascope* from the ESP-View utility menu.
3. In the Settings panel, select a port in the ESP Port listbox.
4. In the Size listbox, change the maximum number of sample buckets in the circular buffer.
5. To start polling, click *Start*. A rotating circle will appear in the lower right corner of the window to indicate that the datascopes is running.
6. To pause polling, click *Pause*. To resume, click *Pause* again.
7. To stop polling, click *Stop*.

You will be prompted to Review, Save or Cancel the session.

- Review - The display will be refreshed with a table containing all the data collected since this sampling was started. To view all the data, you may use the scroll bar, **Arrow** keys or the Beginning, Reverse, Forward or End buttons.

When you are finished viewing the data, you may:

Save the data by selecting *File - Save* from the ESP-View utility menu.

-or-

Start a new session by clicking *Start*. A message is displayed, prompting you to confirm the start of a new session. If you agree, all of the data you just collected/viewed will be discarded.

- Save - A dialog box will appear, in which you may specify where the data should be saved. If you do not save the data, it will be lost when the datascope is restarted.
- Cancel - The polling resumes at the point where the Stop button was clicked.

### **To display a previously saved datascope file:**

From the ESP-View utility menu, click *File - Open*. In the dialog box, indicate the location of the datascope file. The file's contents will be displayed in the ESP-View utility window. To view all the data, you may use the scroll bar, arrow keys or the Beginning, Reverse, Forward or End buttons.

## **Loopback**

The loopback function runs loopback tests on one or all ESP hub ports and displays the resulting statistics. You may configure the port operating values, the loopback mode and the pattern.

The main panel of the Loopback window contains the statistical results of the tests.

- Port - port number
- Tx Bytes - number of data bytes transmitted
- Rx Bytes - number of data bytes received
- Errors - number of verification errors
- Rate - calculated throughput rate, that is, the number of data bytes per second (this calculation will not be the same as the fixed Speed value)

The lower left panel contains the Duration (seconds) field, plus the Play, Pause and Stop buttons.

The lower right panel will contain a rotating circle when the loopback tests are running.

### **To use the loopback function:**

1. Launch the ESP-View utility.
2. Click the *Loopback* tab or select *Tools - Loopback* from the ESP-View utility menu.
3. In the Settings area, select the ESP hub port number or *All*.
4. Select the desired operating values from the listboxes (Speed, Data, Parity and Flow Control).
5. Select a Loopback Mode.



- Internal - the data will be looped back internally.
  - External - the data will go out the port to a loopback apparatus such as a wrap plug.
6. Select a Pattern.
    - Barber Pole - the data is provided by the ESP hub.
    - User Defined - the ESP hub will use whatever is specified in the adjacent Data text field (up to 256 characters).
  7. In the Duration (seconds) field, enter the number of seconds the loopback tests will run. If you specify zero, the tests will run continuously until the Stop button is clicked.
  8. Click *Start*. Polling requests will be sent to the hub every 50 milliseconds. When a reply is received, the display counts are updated. A rotating circle in the lower right corner of the window indicates that the loopback tests are running.
  9. To pause the tests, click *Pause*. To resume, click *Pause* again.
  10. The loopback tests will stop automatically when the configured Duration interval elapses (if non-zero). You may stop the tests at any time by clicking the *Stop* button.

## Status

The Status function displays configuration information and traffic statistics for one or all ESP hub serial ports.

Table 8.2 describes the fields in the main panel of the ESP-View utility Status window. Some information is not valid if the port is not currently in use. In those cases, those fields will be empty.

**Table 8.2: ESP-View Utility Status Display**

Field	Description
Remote IP	IP address of the connected remote client, in network order. If not connected, 0.0.0.0 is displayed.
Connection Method	Current connection method: Idle, serial port redirection, Telnet server, TCP server, TCP client, serial configuration or modem emulation.
Total Rx Bytes	Number of bytes sent to the serial port since the last reboot.
Total Tx Bytes	Number of bytes received from the serial port since the last reboot.
Rx Bytes	Number of bytes received from the serial port since the current connection was established. If not connected, 0 is displayed.
Tx Bytes	Number of bytes sent to the serial port since the current connection was established. If not connected, 0 is displayed.
Parity Errors	Number of parity errors on the serial port since the last reboot.
Framing Errors	Number of framing errors on the serial port since the last reboot.
Overrun Errors	Number of overruns on the serial port since the last reboot.

**Table 8.2: ESP-View Utility Status Display (Continued)**

Field	Description
Speed	Configured baud rate for the serial port.
Size	Configured data size (bits per character) for the serial port.
Parity	Configured parity for the serial port.
Stop	Configured number of stop bits for the serial port.
Flow Control	Configured flow control for the serial port.

The right panel contains a graphical display of a DB-9 connector, which indicates the state of the control signals (red = low, green = high). The transmit and receive signals are always red. If any control signals change, the colors will reflect the change.

The area under the connector graphic will contain a rotating circle when status is being monitored.

**To use the status function:**

1. Launch the ESP-View utility.
2. Click the *Diagnostics* tab or select *Diagnostics* from the ESP-View utility menu.
3. In the Settings area, select the ESP hub port number or *All*.
4. Enter a sampling rate, which specifies how often the hub will be polled.
5. To start polling, click *Play*. A rotating circle in the lower right corner of the window indicates that polling and display updating are occurring.
6. To pause polling, click *Pause*. To resume, click *Pause* again.
7. To stop polling, click *Stop*.

APPENDICES

Appendix A: Technical Specifications

Table A.1: ESP Serial Hub Technical Specifications

Item	Description	
Serial Ports		
Number	ESP-2 MI hubs:	2
	ESP-4 MI hubs:	4
	ESP-8 MI hubs:	8
	ESP-16 MI hubs:	16
Type	Serial - RS-232, RS-422 or RS-485 (RS-232 only on ports 9-16 of ESP-16 MI hub)	
Connectors	ESP-2 MI and ESP-4 MI hub:	DB-9
	ESP-8 MI and ESP-16 MI hub:	RJ-45
Network Connection		
Number	1	
Type	Ethernet: IEEE 802.3, 10/100BaseT; Fast Ethernet: IEEE 802.3U, 100Base T	
Connector	RJ-45	
Dimensions		
H x W x D	ESP-2 MI hubs:	4.11 x 12.07 x 11.13 cm (1.62" x 4.75" x 4.38")
	ESP-4 MI hubs:	4.11 x 14.35 x 17.15 cm (1.62" x 5.65" x 6.75")
	ESP-8 MI hubs:	4.45 x 22.23 x 20.32 cm (1.75" x 8.75" x 8.00")
	ESP-16 MI hubs:	4.45 x 22.23 x 20.32 cm (1.75" x 8.75" x 8.00")
Temperature (operating)	ESP-2 MI and ESP-4 MI hubs:	0° to 50° C (32° to 122° F)
	ESP-8 MI and ESP-16 MI hubs:	0° to 40° C (32° to 104° F)
Humidity	10 to 90% non-condensing	
Power	ESP-2 MI hubs:	9 to 30 VDC at less than 4W
	ESP-4 MI hubs:	5 VDC, 1 amp
	ESP-8 MI hubs:	100-240 VAC, 0.5A, 50-60 Hz
	ESP-16 MI hubs:	100-240 VAC, 0.5A, 50-60Hz
Safety and EMC Approvals and Markings	ANSI/UL 60950-1, CAN/CSA C22.2 No. 60950-1, EN 60950-1, EN 55022:1998 Class A, EN 61000-3-3, FCC Part 15 Subpart B Class A, EN 55024-1998	

**Table A.1: ESP Serial Hub Technical Specifications (Continued)**

Item	Description
	73/23/EEC Low Voltage Directive 89/336/EEC EMC Directive 2002/95/EC "RoHS" Restriction of Hazardous Substances
<b>Application of Council Directives</b>	The product herewith complies with the requirements of the above Directives and Standards. To maintain EN 55024 Product Family Immunity compliance, it is recommended that quality Unshielded Twisted Pair (UTP) or Shielded Twisted Pair (STP) cabling be used, such as that recognized by the ANSI/TIA/EIA-568-A Standard for the serial port media.

## Appendix B: Changing the Serial Port Interface on ESP-2 MI Hubs

The factory default interface setting for both ports on an ESP-2 MI serial hub is RS-232. To enable the RS-422 or RS-485 interface for one or both serial ports (or, if you previously enabled one of these interfaces and now want to enable another interface), use the following procedure.

You will need a Phillips screwdriver. Proper electrostatic discharge (ESD) protection should be used at all times. Use Figure B.1 as a guide.

**NOTE:** The physical interface for the ESP-4 MI, ESP-8 MI and ESP-16 MI hubs is changed in software. See *Physical Interfaces* on page 6 for more information.

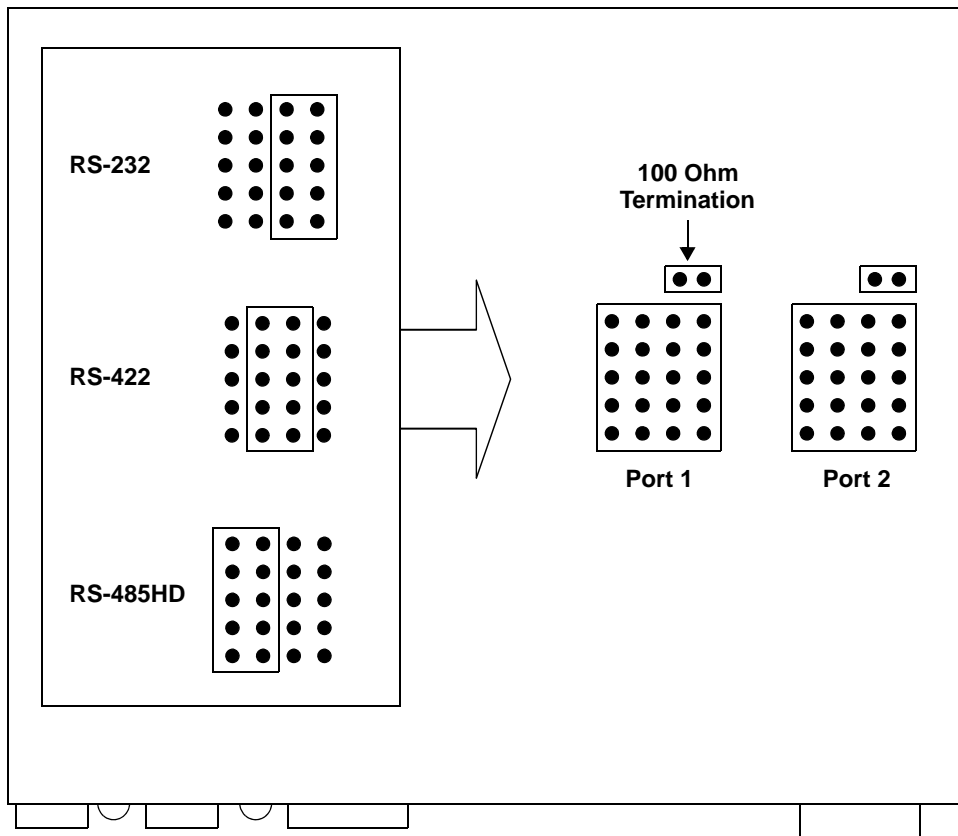


Figure B.1: Jumper Locations and Settings

**To change the physical interface settings:**

1. Place the unplugged ESP-2 MI hub on a flat surface. Use the screwdriver to loosen the two screws on either side of the hub (total of four screws). Remove the screws. Lift the cover up and off the unit.
2. Locate the two ganged headers on the printed circuit board (PCB). Each ganged header contains four columns of five pins. The jumper for each port is ganged and covers two columns.
  - Installing the jumper over the two right pin columns enables the RS-232 interface.
  - Installing the jumper over the two middle pin columns enables the RS-422 interface.
  - Installing the jumper over the two left pin columns enables the RS-485 2-wire HD interface.

To change a port's interface, lift the jumper off its current interface setting and place it on the columns indicated above for the desired interface setting. The interface settings are also printed on the PCB.

3. If you are enabling the RS-422 or the RS-485HD interface on a port, you may also enable/disable 100 ohm termination of the differential receive signal pair on that port. This termination is enabled by placing a jumper on the two pins adjacent to the ganged jumper for the port; see the location noted in Figure B.1.

Termination is enabled by factory default, that is, the jumper covers both pins for each port.

To disable termination, remove the jumper entirely.

See *Termination* on page 7 for more information.

4. When the RS-485HD interface is enabled in hardware, you will be able to select the transmitter/receiver mode. For more information on these software-configurable options, see *RS-485 transmitter and receiver transfer modes* on page 7.
5. Replace the cover on the hub and reinstall the four screws.

## Appendix C: Adaptors

Avocent offers a variety of adaptors. Contact Technical Support for more information.

### RS-422 CAT 5 adaptor

Table C.1 lists the pin assignments for the RS-422 CAT 5 adaptor, which enables use of standard CAT 5 cable twisted pairs for RS-422 receive and transmit signals.

**Table C.1: RS-422 CAT 5 Adaptor Pin Assignments**

Pin Number - DB-9	RS-422	Description	Pin Number - RJ-45
1	RxD (+)	Receive Data (pos)	1
2	RxD (-)	Receive Data (neg)	2
3	TxD (+)	Transmit Data (pos)	4
4	TxD (-)	Transmit Data (neg)	5
5	GND	Ground	N/C
6	DSR (RS-232)	Data Set Ready	N/C
7	RTS (RS-232)	Request to Send	N/C
8	CTS (RS-232)	Clear to Send	N/C
9	N/C	N/A	N/C

### RS-485 CAT 5 adaptor

Table C.2 lists the pin assignments for the RS-485 CAT 5 adaptor, which enables use of one of the pairs of the standard CAT 5 cable twisted pairs for the RS-485 signal pair.

**Table C.2: RS-485 CAT 5 Adaptor Pin Assignments**

Pin Number - DB-9	RS-422	Description	Pin Number - RJ-45
1	RxD (+)	Receive Data (pos)	4
2	RxD (-)	Receive Data (neg)	5
3	TxD (+)	Transmit Data (pos)	4
4	TxD (-)	Transmit Data (neg)	5
5	GND	Ground	N/C
6	DSR (RS-232)	Data Set Ready	N/C
7	RTS (RS-232) *	Request to Send	N/C

**Table C.2: RS-485 CAT 5 Adaptor Pin Assignments (Continued)**

Pin Number - DB-9	RS-422	Description	Pin Number - RJ-45
8	CTS (RS-232) *	Clear to Send	N/C
9	N/C	N/A	N/C

RxD(+) and TxD(+) are both connected to pin 4 of the RJ-45 connector.  
RxD(-) and TxD(-) are both connected to pin 5 of the RJ-45 connector.  
\* RTS is tied to CTS inside the adaptor to indicate an RS-485 connection.

## Other CAT 5 adaptors

**Table C.3: Adaptors for Use with CAT 5 and CAT 6 Cable**

Part Number	Description
210122	RJ-45 to DB-9M (DTE) Adaptor
210120	RJ-45 to DB-9F (DCE) Adaptor
210124	RJ-45 to DB-25M (DTE) Adaptor
210123	RJ-45 to DB-25M (DCE) Adaptor
210125	RJ-45 to DB-25F (DTE) Adaptor
210121	RJ-45 to DB-25F (DCE) Adaptor
210127	RJ-45 to RJ-45 Male Adaptor for Cisco and Sun Netra console port
750238	CAT 5 Serial Starter Kit - includes all the above adaptors
210129	DB-9 Female to RJ-45 Adaptor for modem emulation
210133	RJ-45 Male to RJ-45 Female Adaptor for modem emulation

## Reversing adaptors and reversing cables

**Table C.4: Reversing Adaptors and Cables**

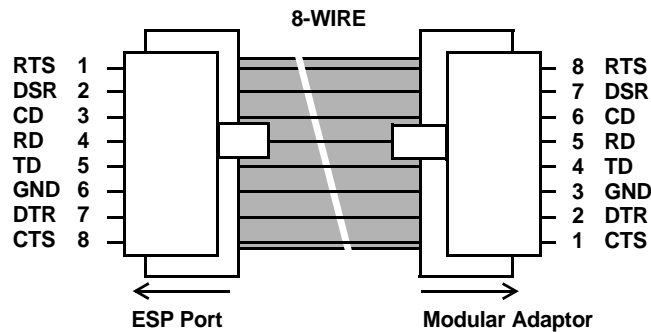
Part Number	Description
210094	RJ-45 to DB-9M (DTE) Adaptor
210095	RJ-45 to DB-9F (DCE) Adaptor
210090	RJ-45 to DB-25M (DTE) Adaptor
210092	RJ-45 to DB-25M (DCE) Adaptor
210091	RJ-45 to DB-25F (DTE) Adaptor



**Table C.4: Reversing Adaptors and Cables (Continued)**

Part Number	Description
210093	RJ-45 to DB-25F (DCE) Adaptor
210105	RJ-45 to RJ-45 Male Adaptor for Cisco and Sun Netra console port
690226	10 foot 8-wire Reversing Modular Cable
690227	25 foot 8-wire Reversing Modular Cable
690228	75 foot 8-wire Reversing Modular Cable
750122	Wiring Starter Kit (8-wire) - includes all the above adaptors and one 690226 cable
210128	DB-9 Female to RJ-45 Adaptor for modem emulation
210134	RJ-45 Male to RJ-45 Female for modem emulation

If you choose to use a third party reversing cable, make sure the cable is reversing, as shown in Figure C.1.


**Figure C.1: 8-wire RJ-45 Reversing Cable**

## Appendix D: Technical Support

Our Technical Support staff is ready to assist you with any installation or operating issues you encounter with your Avocent product. If an issue should develop, follow the steps below for the fastest possible service.

**To resolve an issue:**

1. Check the pertinent section of the manual to see if the issue can be resolved by following the procedures outlined.
2. Check our web site at [www.avocent.com/support](http://www.avocent.com/support) to search the knowledge base or use the on-line service request.
3. Call the Avocent Technical Support location nearest you.

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